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The Farmer's Digest

From more than two hundred magazines and bulletins published in this country and abroad, the Editorial Staff of the Farmer's Digest selects articles of outstanding merit and general interest. It is comprehensive in its scope, covering all phases of Agriculture.

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The Farmer's Digest

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Oyster Farming

The World's Oldest and Most Important Water Farming Industry

Dr. Lewis Radcliffe

Director, The Oyster Institute of North America

FEW persons realize the kinship of water-farming (aquiculture) to upland farming (agriculture)—the growing of seed; the selection of water areas suitable for the particular crop; losses from enemies, flood, winter ice, extremes of temperature, and other factors; the importance of the careful cultivation of the crop and even the fertilization of small bodies of water to increase their productivity. In point of antiquity and magnitude of the harvest oyster farming is our oldest and most important water-farming crop.

A simple form of oyster cultivation flourished in China at a very remote date, according to one authority, thirty centuries ago. According to Pliny, a Roman Noble, Sergius Orata, was cultivating oysters about 95 B.C., in beds near Rome, a venture that made him rich. The advent of the industry in this country appears to have grown out of an accident when in March, 1835, a schooner laden with Virginia oysters arrived at New Haven, Conn., too late for that season's market and so the oysters were dumped overboard in one of the nearby coves. The following autumn it was discovered that these oysters had increased at least a third in size and were of excellent flavor—the first step in the transplanting of oysters. Today about 60% of our annual harvest of over 16 million bushels is gathered from cultivated grounds.

Oyster farming as practiced in the United States consists of:

1. Acquiring ownership or the right to use suitable submerged bottoms.
2. Cleaning and preparing the bottoms.

3. Planting of thousands of bushels of oyster shells.
4. Insuring the production of larval oysters by nearby stocks of adult oysters.
5. Protecting the oysters from their enemies.
6. Transplanting the harvest of seed oysters to growing grounds and further transplanting to prevent overcrowding and to facilitate growth.
7. Transplanting to maturing grounds for fattening and accessibility for harvesting for market when the oysters are 4 to 6 or more years old.
8. Culling and sorting for market.

In some cases oyster bottoms are owned outright, and may be bought or sold the same as any other property; in other cases they are held under renewable leases, the terms of leasing varying greatly in the different states. However, in some states the free fishermen have so vigorously opposed the granting of exclusive rights that there is little incentive for private enterprise to engage therein, resulting in the serious depleting of the natural supply. In some states, the state government tries to maintain the supply on free bottoms by the planting of large quantities of shells and seed oysters which contributes to prevent the complete exhaustion of some of these areas.

By trial certain areas have been discovered to be better than others for getting a "set" of seed oysters. These are used by the oyster farmer as seed grounds, and the resulting crop is sold to the oyster planters. In advance of the summer spawning season, these grounds are carefully cleaned by dredging off the surface coating of old shells, debris and the natural enemies of the oyster. Then as the spawning season approaches, oyster shells from the shucking houses are scattered over the grounds, usually at the rate of 500 to 1000 bushels per acre. Spawning beds of mature oysters are maintained close by or groups of large adult oysters are placed on these seed grounds on top of the shells.

Our eastern oyster is very prolific, a single female being capable of discharging from 100 to 500 million eggs in a single season and the male, millions of mobile spermatozoa. Of these millions of eggs, very few are fertilized and pass through the larval free swimming stages before attaching (setting) themselves to some hard, clean object such as old oyster shell. However, in our northern production area, conditions are such that a good set may be obtained only once in 4 or 5 years, while in warmer southern waters the annual set may be so heavy as to nearly smother the growths of previous

years. Under favorable conditions for the larval oysters, they sometimes attach themselves on the old shells literally covering the shell, numbers present ranging from 1,500 to 65,000 for each bushel of shell.

Just as the upland farmer battles against bugs, weeds and other factors, the oyster farmer faces the loss of his crop from the depredations of drills, drumfish, conchs, starfish, mussels, boring sponges, boring clams, and leeches, and he may also suffer losses from heavy storms, winter ice, silt, drifting sands and other causes. The hurricane which hit Long Island and New England on September 21, 1938, did a tremendous amount of damage to the oyster beds. In reducing the number of enemies of the oysters, the oyster farmer has evolved many unique methods. One of the most destructive enemies is the starfish. These are caught up by means of "star mops," an iron bar about 10 feet long to which are attached 8 or 10 large mops or brushes of heavy rope yarn about 4 feet long, dragged over the bottom, entangling the stars in the yarn. In recent times lime has been spread lightly over the bottom. Whenever the particles touch the surface of the star, there is rapid disintegration of the skin and lesions are formed which usually kill the star. Oyster drills are caught in traps and in these and other ways, means are sought to lessen the destructiveness of the oyster's enemies, especially to the small seed oysters.

If the seed grounds are reasonably safe from winter storms and ice, the young growing oysters of the year's set may be left on these grounds for a year or more; otherwise in the fall they will be shifted to growing grounds. The term "seed" oyster is rather loosely applied to set which may be only a few months old and no larger than one's finger nail up to oysters of about market size purchased for planting on growing grounds. Many of the growing grounds are in waters in which the oysters will not spawn naturally and thus can be graded according to size. As the oysters increase in size on the growing grounds, they are thinned out, the surplus being transferred to other grounds so as to provide for maximum growth and uniformity as to shape. Thus by the time the oysters are 4 or 5 years old they may have been transplanted two or three times and may again be transferred to maturing grounds in shallow water for fattening and in order to make them more accessible for marketing. In spite of the fecundity of our eastern oyster, enemies, losses in transplanting, etc., leave only a very small fraction of 1 per cent to

mature and reach the market.

In transplanting and harvesting the crop for market, the oysters are gathered up in dredges—a triangular frame with a toothed bar for freeing the oysters from the bottom and a meshed bag which may hold as high as 25 or 30 bushels. The dredge is dragged over the bottom and hoisted aboard with its catch where the oysters can be culled, saving the small, unmarketable oysters for returning to the beds. On the free grounds much of the stock is taken up by means of hand-operated scissors-like tongs, fitted with teeth for loosening the oysters and a basket for holding them as they are raised to the surface.

In marketing the crop the oysters may be sold as shellstock, as fresh opened (shucked) oyster meats, quick frozen or canned (processed). The processed product includes oyster juice, puree, chowder, and smoked as well as the plain processed whole oyster meats. The great bulk of the crop is sold as fresh oysters, chiefly shucked oyster meats, reducing bulk and saving in transportation costs. The fresh shucked meats are packed in containers of tin, glass and paper, surrounded with ice to keep them cool. In fact, as soon as the oysters are shucked they should be held at temperatures of about 35° F. and as they leave the packing houses, the can is filled with solid meats. In purchasing oysters be suspicious of a large amount of "oyster juice," some of it may have come from a nearby tap.

The two most popular methods of serving oysters are the stew and on the half-shell. As stated in a government report "The most popular way of serving oysters is in the form of a stew in which oysters are combined with milk. Oysters are known to contain all of the minerals which have been found necessary to maintain good health." This report should have added that a real oyster stew calls for a third as much cream as milk.

In conclusion it should be pointed out that oysters are our most widely distributed marine fishery, which extends from Cape Cod to Texas, and along the shores of the Pacific States. It ranks first as a source of employment, with 60,000 persons engaged in it. It brings to the nation from 15 to 20 million dollars in added wealth each year. Of the 13 million acres of tidal bottoms along our coasts, oysters are now growing on about one million acres and 20% of this acreage which is under cultivation produces about 60% of our annual harvest. On this basis it appears that our oyster farmers will be able to expand their operations to meet growing demand for a long period.

Greener Pastures

Condensed from The Fertilizer Review

R. H. Lush

Pasture Specialist, The National Fertilizer Association

PASTURE improvement offers great opportunities in the South. It opens the way for more and better milk and meat produced at lower cost. It is a powerful factor in erosion control.

There are striking economic advantages for southern farmers in a vigorous pasture improvement program. At present the 13 Southern States, from Virginia to Texas, and including Kentucky, have 30,532,000 acres, or 31 per cent of the plowable pasture land in the United States. These same States have 19,717,000 head of cattle, or 29.5 per cent of all the cattle in the country. But the value of southern cattle is estimated at $522,638,000 or only 20.3 per cent of the value of all cattle.

The Southern States have 26.03 per cent of the country's total milk cows, but only 17.6 per cent of the value of all milk cows. And southern dairy herds produced only 18.8 per cent of the nation's milk.

Southern cattle are of low value primarily because of poor feeding conditions. The trend is toward more livestock. Every southern State except Texas increased its cattle population and value during the past year. But much of the beef cattle production in parts of the South has been on other than plowable pasture land. There are about 200,000,000 acres of forest land which are used as open range, millions of acres of woodland farm pastures, other pastures, and especially crop acres which are pastured largely because of lack of fences. Much of the forest land will ultimately be fenced to control grazing and encourage reforestation.

Stock laws, disease eradication, and improved livestock production encourage more fencing. The development of electric fences through rural electrification may increase the subdividing of large pastures. Once the land area is well fenced, more progress in pasture improvement can be made.

Agricultural agencies are intensively encouraging more livestock production for home consumption, and, where advisable,

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for commercial production, to supplement a reduced cotton income. The need for livestock production for home consumption is far from being met at present.

It has been estimated by Dr. O. E. Baker that pastures and other forage crops furnish more than 50 per cent of all the nutrients fed to farm animals in the United States. In the South that figure could be higher inasmuch as good pastures furnish cheap feed for a long growing season. The immediate problem is to take advantage of better methods of pasture production.

The immediate gain to farmers that would accrue from participation in a pasture improvement program is apparent from many recent experiments. Pasture crops, because they cover the land, utilize added plant food more completely than row crops. The return in increased pasture growth is immediate when livestock products are marketed. It has been profitable in many southern tests on different types of soil.

At Lufkin, Tex., 40 acres of improved, phosphate-treated pasture carry 30 head of cattle, while unimproved pasture in the neighborhood has a carrying capacity of only one head to 20 acres. The grazing season has been extended from 150 days to 270 days.

On a farm near Appomattox, Va., untreated land has produced 76 pounds of beef per acre, whereas land that has received the proper fertilizer treatment has produced 161 pounds of beef per acre, and competent persons estimate that the value of the land has been doubled in seven or eight years. An experiment in Kentucky has shown that the production of beef per acre can be trebled by the use of superphosphate alone, and the cost reduced to one-third. The unfertilized land produced, in this experiment, only 46 pounds of beef per acre at a cost of 9.6 cents per pound while the fertilized land produced 152 pounds of beef per acre at a cost of 3.1 cents per pound.

Over 2,000 pasture demonstrations have been started in Alabama in the past two years. Experiments at the Black Belt Substation in Alabama disclose that 300 pounds of beef per acre can be produced through the application of superphosphate, with a profit of $3.50 per acre on the fertilizer applied.

Ten tests with dairy farmers in Louisiana in 1937 and 1938 averaged 35.9 per cent more milk and 37.4 per cent greater return for fertilized pasture than for unfertilized in the same field.

The fact that livestock remove a large amount of plant food is not recognized by many livestock men. An average cow will eat 100 pounds or more of palatable pas-

ture grass in a day. During the grazing season she will consume the equivalent of two tons of mixed clover hay. That much feed removes from the soil plant food equivalent to 720 pounds of nitrate of soda, 130 pounds of superphosphate, 155 pounds of muriate of potash, and 37 pounds of lime. Even with the conservation of the manure, one-half of the nitrogen and phosphorus and 30 per cent of the potash may be lost to the pasture soil.

The higher quality of grass produced by improved pastures has been emphasized by recent experiments. Louisiana data show that early spring pasture hay contains nearly twice as much crude protein as that cut in August or September. However, the application of nitrogen and superphosphate raised the protein content a whole per cent each cutting when compared to a similar crop from unfertilized pasture.

Seven years' results at the Hammond Station gave a 23.5 per cent increase of pasture hay for an application of 300 pounds of 16 per cent superphosphate. This hay averaged 42.2 per cent higher phosphorus content than hay cut on the same date from plots without phosphorus. Liming increased the lime content of hay 20.2 per cent.

Not enough emphasis can be laid on the fact that pasture tends to conserve the soil. According to the 1938 Yearbook of the United States Department of Agriculture, a 1934 survey of wind and water erosion in the South (including Delaware, Maryland, and West Virginia) showed that 38,000,000 acres, or 5.8 per cent of the total land area, have already been destroyed by cultivation. Another 64,000,000, or 9.7 per cent, has been subject to severe erosion and has lost over 75 per cent of its topsoil. Most of that land is by necessity out of cultivation. But 230,000,000 acres, or 34.7 per cent, are subject to moderate erosion, and 31.6 per cent have been highly affected by erosion. It is the two latter groups with which we are concerned.

We must consider pasture as one of the farm's most important crops, especially in its relation to other crops in a balanced rotation. More land in pasture and less in other crops should be the objective for each farm in the future.

Managing Loblolly Pines

Condensed from The Southern Planter

Wilbur O'Byrne

Extension Forester, V. P. I.

A farmer friend recently asked "What do you mean by managing timber? It just grows, doesn't it?" Since others may have the same question, a word of explanation may be in order. The dictionary says that to manage is to guide or control affairs. Managing loblolly pines then, is to control or guide them; presumably, in such a way as to make them most profitable.

As to loblolly pine: It is the common pine of Eastern Virginia —the one which is often referred to as longleaf, black, or just plain pine. It is at home and makes its best growth on the sandy soils of the Coastal Plain, as contrasted with shortleaf pine which replaces it on the clay lands farther west, and Virginia scrub (spruce) pine which has a tendency to crowd out both where the soil has been badly abused. Loblolly is the most profitable pine to grow throughout the Tidewater and management should concern itself with keeping it well represented in the forest and growing vigorously.

One of the questions landowners frequently ask is: "Which is the more profitable to grow, pulpwood on a short rotation, or sawlogs and waiting longer for the harvest?"

There are few places in Eastern Virginia where an owner cannot now sell both pulpwood and sawlogs. There are three new pulp plants in Eastern Virginia and nearby North Carolina, while most of the older ones have practically doubled their capacity. Nor are sawmills, stave mills and veneer plants lacking. The market is here. All that is necessary to hold it is for owners to manage their timber lands so that raw materials will continue to be available.

The two greatest dangers are: First, that owners will try to sell timber faster than the market can use it; and second, that they will permit the present crop to be cut without having made provision for another. Both would be bad for the manufacturer, but worse for the landowner. Most manufacturers would rather buy their wood than to raise it. They know that farmers can raise timber more economically than they can possibly do it. They may feel that it is prudent to grow some for

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emergencies, but it is the policy to encourage private owners to grow wood as a cash crop.

This appears to be an ideal set up for effective co-operation. The manufacturer wants to buy wood. He wants it regularly and available over the years. The farmer wants to sell wood under the same conditions. The manufacturer's responsibility will be for fair prices and impartial dealings. The farmer's part will be to keep his land at work producing the type of material for which there is demand. In most localities this means both pulpwood and logs.

There are many reasons why it is better for the average landowner to manage his timber for both pulpwood and sawlogs than for either alone:

(1) Pound for pound of wood actually used, logs normally bring a much better price than pulpwood; but they entail greater waste. By marketing suitable portions of the larger trees as logs, and working the smaller and rougher material into pulpwood, highest prices may be had for everything that is cut.

(2) If the trees start thick enough to grow straight and tall, a large number will have to come out before any of them reach sawlog size. Most of these will make acceptable pulpwood.

(3) By thinning out the less vigorous trees, growth will be concentrated on the better specimens. And when the time comes to start the next crop, there will remain only these better trees to supply the seed.

(4) Young trees of the size usually cut for pulpwood are scant seeders. If some of the best are held to grow to large size, an owner is sure of getting his land well "set."

(5) Cutting for both pulpwood and sawlogs yields more wood, a larger and steadier income and spreads it over a longer period than cutting either separately.

Cut lightly and often. This is the secret of good forest management, but it means that the landowner must take active interest in his woods operations. If he does not, he can scarcely expect a contractor or employee to do it for him. Their attitude is apt to be that of the old colored man who remarked: "You're zacly right, Cap'n—e'zacly right! But if de boss man don't care enough about his own woods to come out here and make me do it, I's not gwine't break my back."

The old time method of selling lumber was by the boundary, which put the owner at a disadvantage. In the first place, he was less able to estimate accurately than the man who worked at it constantly. Sometimes he got paid for what he had, but usually he did not. The purchaser had but one interest—immediate profits. The condition

of the cut-over area did not affect him. Trees that were too small to sell, were apt to be knocked down or used for corduroy. The owner was left with a piece of land from which he could expect no income for many years, and the best he could get was the stumpage value of his trees.

Good roads and trucks have changed this. The seller can now pick his market and truck to it. By cutting each year only so much as he can handle, and doing it at odd times, a farmer can sell his slack season labor along with his wood. Selling by the measured cord, he gets paid for all that is cut. He gets the same amount of money from a fraction of the timber. And by saving his choicest trees to supply seed he can build up his forest as he now improves his livestock.

There is infinite variety in our forest growth, and each calls for different treatment. Old field stands are apt to be over-thick, with all of the trees the same age. The little trees are weaker ones which fell behind in the struggle. A light cutting here might be compared to thinning corn: The poorer specimens are chopped out leaving the best, properly spaced for growth. The principle difference is that forest thinnings can be used—for pulpwood, fuel wood or what ever they will make—and so pay for the operation.

Thinning should start as soon as the trees are large enough to pay their way, and be repeated as often as it can be done profitably. By the time the best trees have reached good sawlog size every one should be a vigorous well developed specimen. In most cases, woods which have been thinned will have as much wood as the unthinned, and in addition almost as much more will have been taken out and sold.

Where the woods is made up of trees of all ages mixed together, the little trees are young, and respond to an opening of the stand. Here best results may be had by selecting a few of the largest trees, taking the better portions for logs, and turning the rougher parts, together with sound portions of defective trees, into pulpwood or fuel. The smaller trees are left to grow. With care, this kind of cutting may be repeated as frequently as once in ten years. And with trucks to do the hauling, such cutting can be done practically as cheaply as where the land is stripped.

A third type of forest, although common, is not so easy to work with because it has been all but ruined. It is the cut-over area which has been more or less "taken" by inferior hardwoods. The problem here is to get the hardwoods under control and reestablish pine. It is not necessary or desirable to get rid of all the

hardwoods. One hundred good trees per acre, well distributed, are enough, provided they are permitted to get their heads out and above competing sprout growth.

This condition has so many variations that detailed discussion would be hopeless. Instead, it is suggested that owners consult their county agents. If they can't tell what to do, they know where to get help.

What has been said here applies particularly to farmers and other small owners who are able and willing to supervise their own operations. For others there are two possibilities. One is to sell (before it is ruined by overcutting) to someone who has, or is acquiring, enough land to justify the services of a forester. The other is to join hands with other small owners in an association or other co-operative effort, and so accomplish the same result. No one (except for speculation) would think of buying or holding a farm without either farming it himself or employing a farmer to do it for him. It is equally foolish to think of getting satisfactory results from forest land without competent management.

The loblolly pine forests of Eastern Virginia are so easy to manage, and the markets are so good, that most farmers can become pretty good foresters if they will study their woods and use the knowledge they have or can get through the agricultural colleges.

What Does the Hay Stack Weigh?

Condensed from Washington Farmer

THOUSANDS of tons of alfalfa and other kinds of hay are bought and sold annually in the stack. These stacks are usually bought and sold on the basis of what the hay in them weighs, and rather than go to the expense and effort of weighing them, their weights are usually computed by measuring the stacks. An investigation has shown that the rule most commonly used for determining the weight of stacks is quite inaccurate for some types of stacks. The error usually is on the side of too little weight, and growers who sell alfalfa on the basis of that system may be selling more hay than they are getting paid for.

First, it is necessary to know the weight of a given volume of hay before the weight of a stack may be computed. The weight of a certain volume of hay naturally varies with the length of time it has been in the stack. The following table is one prepared by the United States Department of Agriculture for determining the weight of stacked hay:

	Cu. ft. per ton	
Kind of hay	Stacked 30 to 90 days	Stacked longer than 90 days
Alfalfa	485	470
Timothy	640	625
Wild hay	600	450

In order to get the weight of an entire stack, it is necessary to measure it, to learn the number of cubic feet it contains, then apply the foregoing weights. Three different types of stacks each require a slightly different rule to determine their volume accurately. A low, round-topped stack, a high, round-topped stack, and a square, flat-topped stack each require a different rule.

Regardless of the type of stack, it must first be measured for width, length and overcast. The width is the distance across the stack the narrow way, measured at the ground. The length is the distance the long way at the ground, and overcast is the distance from the ground on one side, over the stack at its highest point, to the ground on the other side.

Reprinted by permission from the Washington Farmer, July 20, 1939

The rules for determining the volume of the three types of stack are as follows:

For low, round-topped stacks, multiply the overcast by .52; multiply the width by .44 and subtract this product from the first figure. Multiply the result by the width, and multiply this figure by the length.

If "O" is taken as representing the overcast, "W" represents the width and "L" represents the length, the rule for low, round-topped stacks could be written as follows:

Volume equals (.52xO) minus (.44xW) times W times L.

Applied to a stack of the low, round-topped variety that is 20 feet wide, 50 feet long, and 30 feet over, the rule would work out as follows:

(.52x30) minus (.44x20) times 20 times 50 equals volume. 15.6 minus 8.8 equals 6.8. 6.8 times 20 times 50 equals 6800 cubic feet, the volume of the stack.

Assuming that the stack was alfalfa hay, which had been stacked more than 90 days, we find by referring to the first table that hay of that type requires 470 cubic feet to make a ton. If we divide the total volume of the stack, 6800 cubic feet, by the number of cubic feet per ton, 470, we get 14.4, which is the number of tons in the stack.

The volume of high, round-topped stacks equals (.52xO) minus (.46xW) times W times L.

The volume of square, flat-topped stacks equals (.56xO) minus (.55xW) times W times L.

About the same rule may be applied for determining the volume of stacks of long hay or of chopped hay. However, the weight of chopped hay is much greater for the same volume than is long hay. An average weight for a number of samples of chopped hay weighed by one of the experiment stations, showed that only 150 cubic feet of chopped hay weighed a ton. This would indicate that a stack or mow of chopped hay would weigh from three to four times as much as the same volume of long hay.

Pig Finish in 5 Months

Condensed from Capper's Farmer

George A. Montgomery

WEIGHING age for pigs in the Indiana market hog show had to be changed from 180 to 170 days because growers using the John Schwab method were making them too big. When Illinois brought out a system that combined the McLean county plan of swine sanitation and a method of balancing corn with protein supplement, growers were told they could expect 200-pound pigs in six months if they gave faithful attention to details.

That sounded just a bit wild to some who had been selling 9-month-old pigs at that weight, and Indiana results may seem just as wild to growers who adopted the Illinois plan and have since contended that "You can't beat legume pasture, shelled corn and tankage in self feeders for rushing pigs to market size." In light of the present knowledge, that statement needs considerable modification and it is probable half the farmers in the United States who know it and can tell you what modification to make, live in Indiana where John Schwab, the State's extension swine specialist, has been holding his hog schools.

Two of them are Homer Whitehair and his son, James, who live in Delaware county, Indiana. The father is accounted a good hog raiser, and has held for a number of years to a routine identical with the Illinois system. He has good stock and has had no difficulty in producing 200-pound litter averages at 180 days. In the spring of 1938, James decided to enter the state show and nominated a litter of 10 pigs farrowed February 18. Along with litters raised by the father, they remained in a banked A-type sow cot at the farmstead more than two weeks, then were moved with the mother and the house to a small lot with bluegrass turf.

In the new lot a creep feeder was set up and filled with a special pig starter mash, which is one of the most important of Schwab's original contributions to swine production. It is composed of 7 parts finely ground yellow corn, 2 parts cracked wheat and 1 part protein supplement, and is familiarly known as the 7-2-1 mixture. Originally, it was intended for use from the time pigs were a week old until they were weaned. When a grower adopted it as a part of his pro-

Reprinted by permission from Capper's Farmer, Topeka, Kansas, September, 1939

gram he observed invariably that he had larger, thriftier pigs at 8 weeks old. Many growers contended their pigs were twice as heavy when weaned. Larger size gave them greater capacity for feed consumption and they continued to gain more rapidly throughout the feeding period.

A good hog man hesitates to discontinue a ration that gives such striking results, and all over the state Schwab began to notice men who kept it in feeders until shotes weighed 100 pounds. Young James Whitehair fed it to his Chester Whites until they were sold, and when they were weighed for the contest at 171 days they averaged 248 pounds and a barrow that was heavier than the others tipped the scale at 286. The 12 heaviest pigs from the father's litters were sold when 188 days old, averaging 225 pounds. They had been raised on clover pasture, which is considered superior to bluegrass, with a ration of corn and tankage. They were the pick of other litters, but averaged 23 pounds less when 17 days older.

Young Whitehair's experience, and that of other Indiana growers, indicates that the near future may see the better hog men everywhere aiming at 200-pound hogs with enough finish for market toppers at 5 months old. Continuing the 7-2-1 ration to market age made the Whitehair litter too fat and too heavy at 170 days. The barrows probably should have been sold at 5 months and the gilts not later than 5 months, 10 days.

At the state show, the Whitehairs found that dozens of feeders were continuing the 7-2-1 as long as they kept their pigs. They were marketing their hogs at an earlier age than ever had been possible when the standard ration was used in the final weeks of the fattening period.

Indiana Experiment Station has demonstrated that faster gains may be made with a varied protein than with one source or a combination of any two. Schwab is carrying this information to hog men of the state, and they are adopting the mixture that has proved most satisfactory. For spring pigs it is composed of 20 pounds of tankage, 20 pound fish meal, 40 of soybean meal, 10 of linseed meal and 10 of cottonseed meal. This is varied for winter feeding by taking out 10 pounds of the soy meal and adding 10 pounds of alfalfa meal.

Roy Swain, Rush county, tried this protein on 23 March litters. They were from the same aged sows and the same boar that produced the pigs he sold the year before, but they averaged 30 pounds more a pig at 170 days old. The various truck loads averaged 226 to 243 pounds a hog. The only change in methods was

substitution of the varied protein for tankage.

The third important factor in the Indiana method was introduced by the Indianapolis show itself. That is the importance of the right type of sows and sires. Packer buyers serve with college men as judges at the show, and those in attendance have noted in every case that they pick pigs that are shorter legged, thicker hammed, wider loined than the tall, rangy hogs to which some of the leading breeders have run in recent years.

There is a definite preference for sows that run to the rangy type. They usually have larger litters and show ability to feed them better, and farmers are holding to that type but looking for better hams and loins and not quite so much legginess.

All growers choose gilts with enough strong teats to feed a litter of 10 to 14 pigs, and most of those who produce their own select daughters of gentle mothers that have produced large litters, saved them and made them big and rugged by weaning time. As a sire, they want a boar with short legs, wide loin and a thick, well rounded ham that shapes up to packer style without excessive top trim.

A few years ago Indianapolis packers complained to Schwab of the poor quality of hogs shipped to that market and said they had to go into Chicago and terminals farther west to get fancy killing hogs. Today the situation is reversed, and Chicago buyers are going into Indianapolis for their extra quality stuff.

A great deal of stress is placed on a routine that will insure against any kind of a setback for pigs. In many areas of other states, pigs are castrated, vaccinated and weaned with one handling. That is more convenient, but Indiana growers contend it doesn't pay. Grover Arbogast, of Delaware county, castrates at 5 weeks, vaccinates at 6, and weans at 8. Hinchman and Horney both castrate at 4 weeks and wean at 8. Hichman vaccinates two weeks before weaning and Horney one. The general weaning practice is to remove the sows from the pigs and separate them so widely they cannot hear one another squeal.

Castration at 4 weeks is extremely tedious, both Hinchman and Horney agree, but at that age a pig hardly bleeds and he heals up in a few days.

Crossbreeding is almost universally practiced for market hogs, tho some farmers following the Schwab method produce purebreds for litters from which to pick sow replacements. Arbogast produces crossbred spring litters and purebred fall litters. He uses fall gilts as brood sows, lets them produce but two litters,

then sells them. Hinchman, who keeps a sow for four litters, produces purebreds every fourth time. Horney, who has about 20 sows furrow in each of four months, produces crossbreds in January and July and purebreds in March and September. Spring and fall litters care for a demand for breeding gilts at premium prices and replace sows in his own herd.

Mass Attack on Rats

Reprinted from New Jersey Farm and Garden

RANKING high in the list of public enemies around the poultry farm is the rat. Not only does he destroy chicks, but it has also been estimated that a mature rat will consume seventy to eighty pounds of mash a year, which is as much as the ordinary laying hen consumes.

Annoyed by an unusually heavy invasion of rats and mice during the spring, our poultry department launched a counter-attack with rather startling results. A center of the rodent infestation was the long laying house, and this was chosen for the tryout of a new method.

A powder made by grinding up the bulbous root of red squill was selected because it is reported to be a specific rat poison and harmless to poultry. The powder was mixed with regular laying mash at the rate of one pound of poison to sixteen pounds of mash.

The attack was to be launched at night, so grain was withheld that afternoon from all poultry flocks in the long house and all mash hoppers were emptied so as to assure a hungry rodent population for the evening. Using the same hoppers and containers which the rats were accustomed to visit, workers distributed the poison mash at 9 P.M., taking care not to touch it.

Next morning they gathered 152 dead rats and a peach basket full of dead mice. The odor soon revealed that many more had died in their holes, and still others were picked up here and there on the grounds and even on property of a neighboring manufacturing concern.

The mash was removed before daybreak from all but one hopper, but birds which ate the red squill showed no ill effects. Success of the drive led us to repeat it in the rest of the poultry plant, and similar attacks will be made from time to time in the future as conditions warrant.

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The Saga of Cypress

Condensed from Armour

LIKE so many things which everyday use makes commonplace, lumber has a background of interest largely unsuspected by the average person outside the industry. This is especially true of cypress lumber.

In the forest, nature is constantly applying its energy either to assembling its elements in the process of growth, or to separating them in decomposition or decay. But cypress is one of the forest's products that is most successful in evading the latter process, and thereby has earned for itself the description "The Wood Eternal."

It is thought that the cypress group was derived from the pines several million years ago during the Mesozoic age—the age of the first birds and the great reptiles. In this prehistoric period the cypress family came to extend over Europe and North America as far north as Greenland and down to the shores of the Mediterranean, but as the Ice Age approached the cypress retreated south into the swamps and finally became a swamp tree. Thus cypress represents one of the few surviving members of prehistoric species.

Where we use the word cypress, we refer to what the United States Government designates as the coast type of cypress, or as it is now commercially known and specified, tidewater red cypress, to differentiate it from the other varieties. The tidewater red cypress is the member of the group now found in these ancient swamps.

The cypress is one of the most picturesque trees of the American forests. Although a conifer, the cypress is unusual in that it sheds its leaves in the fall; it is a slow-growing tree, and reaches its best development in swamplands. Trees over a thousand years old, towering to heights of over a hundred feet, are commonly found in virgin stands. Most of the trees are heavily laden with Spanish moss, presenting a weird yet beautiful picture. The mature tree develops a swelled butt of 8 to 15 feet in diameter and is surrounded by so-called cypress knees, which are offshoots of the roots extending several feet above low water. It is believed that these protuberances serve the double purpose of respiratory organs and anchorage.

Practically all of the old Spanish buildings erected in the south-

Reprinted by permission from Armour, August, 1939, Chicago, Illinois

ern part of the United States were of cypress construction. The Cabildo, or Spanish Court House in New Orleans, is one of the oldest buildings erected by the Spaniards in America. It stands today practically the same as when built. It is almost entirely of tidewater red cypress construction. Frame timbers, joists, rafters, studs, plates, doors, window shutters, are all cypress, The Cabildo is now a museum, and on exhibition there are some old Spanish prison stocks of cypress which have withstood over 200 years of exposure.

In 1936 the United States Treasury undertook the restoration and remodeling of the old St. Augustine Post Office. This building was erected by the Spaniards about 1600, and was originally the Spanish Governor's mansion. St. Augustine has been in the possession of Spain, France, England, and the United States. If we include the Republic of Florida, and the Confederate States of America, six different flags have flown over the city and probably over this old structure. It was found that the Spaniards in erecting these old walls, used quite a number of cypress timbers as well as other kinds of wood. Hand-hewn timbers were used as lintels over the doors and windows, and in some sections the lintel line was carried along the entire rock wall. These timbers were supported by vertical posts which in some places came down and rested on the ground. The old hand-hewn timbers were largely spiked together with hand wrought iron spikes, although some mortise and tenon joints were found. Evidence was found that termites had been at work in the structure. Termites had in some cases started a few holes in the cypress and then moved elsewhere for food. The cypress used was still in perfect condition.

It appears that termites do not like the taste of the preservative resin known as cypressene which to 100 per cent permeates every portion of a cypress board, and to which the decay resistance of cypress is due.

All through the South is irrefutable proof of the longevity of cypress construction. Numerous mansions and plantation buildings, many erected in prerevolutionary days, are still in an excellent state of preservation after 150 or more years of service, and give promise of providing another century or more of shelter and comfort.

Hand-rived cypress shingles covered the roofs of these old plantation homes and these shingled roofs are still weathertight after more than 100 years of exposure to the elements. When Lawrence Washington built Mount Vernon in 1743, he

shingled it with hand-rived cypress shingles. After General George Washington inherited it in 1752, and made additions, he too used cypress shingles on the roof. He wrote: "Nothing but durable materials shall be used in this house." In 1918 when these old weather-beaten shingles were removed, and the mansion re-shingled with cypress, of course, the wood was sound, without a sign of decay after 175 years of exposure.

The deciduous cypress, or swamp cypress, or American bald cypress, or tidewater red cypress, has a wood that is light, soft, straight-grained, easily worked, and is very durable. Its durability in resistance to water is remarkable. What man attempts to do when he injects creosote or other chemical preservatives into the surface area of other woods, nature has done for cypress, by growing a natural preservative into its innermost cells. Undecayed pieces of cypress logs over 100,000 years old have been dug out of old river bottoms.

In Mexico there are a few immense cypress trees that are larger in girth and older than any of the giant Redwoods of California. In the Mexican village of Santa Maria del Tule is a cypress tree 125 feet high, but 127 feet in circumference, or about 42 feet in diameter. Its age is estimated at from 5000 to 7500 years. It is considered to be the oldest living thing on earth. Florida possesses a Cypress tree over three thousand years old. Large cypress trees grow at the rate of about 1 inch of radius for each thirty years.

There is real adventure in the production of cypress lumber. Some of the finest, biggest timber grows in immense swamps, where the land is submerged much of the year. Horses or mules cannot work under such conditions, and the use of modern tractors is not practical. One of the first solutions to the problem of making these stands accessible was to build canals through the swamps in order to use large pullboats to drag the cypress logs out of the woods and then tow them to the mill. Many of the large cypress mills are still located on tidewater as the result of this early logging innovation. In recent years the pullboat operations have to some extent been displaced by logging railroads built on piling or on filled-in ground. Once a railroad is built into a swamp, the skidders move on the tracks; then with over head cables the logs are dragged from the forests and loaded on railroad flatcars for delivery to the sawmills.

Tidewater red cypress is chemically inert. It gives off no color or taste to food stuffs, not even to the most susceptible foods

with which it comes in contact. A number of industries, including packing, paper, textile, liquor, foundries, tanneries, canning and other food-processing factories use large quantities of cypress each year because of its resistance to chemicals, particularly to the action of commonly used acids and alkalies.

However, the amazing record of tidewater red cypress for durability and longevity has been its strongest recommendation for use in refrigerator car construction and for other rolling stock. It has proven its ability to keep down maintenance costs, and over three million and a half feet of cypress go into the construction of railroad cars each year.

Late Grazing Winterkills

IN recent years pasturing the alfalfa field has become a popular practice. But many farmers find they have to reseed after 1 or 2 years. The plants apparently are winter killed.

Tests at the Michigan Experiment Station in co-operation with the United States Department of Agriculture show that winter injury can be avoided by following a grazing plan which allows the alfalfa to renew its growth in the fall before cold weather sets in. Alfalfa that is not fall grazed has an opportunity to store reserve food in the roots and to develop more, and more vigorous, crown buds.

Three grazing plans were followed in the tests. The different lots of alfalfa were pastured from April 30 to August 28; May 14 to August 28; and May 14 to October 16. Where the alfalfa was pastured through September and the first part of October the stands left the following spring were of little use either as hay or pasture. There was a marked heaving of dead plants during the winter and spring.

In the lots where grazing was discontinued on August 28 there was no indication of winter injury, no heaving was apparent, and excellent stands of vigorous alfalfa were available for pasture the following year.—*Shorthorn World*

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Importance of Grade

Reprinted from Beef Cattle

Prof. Roscoe R. Snapp

THE cattle markets of the country do not recognize "type" as such. Instead they recognize "grade." Cattle intended for a particular purpose are classified as choice, good, medium, or common, depending on their desirability for the use to which they are to be put. The well-bred steer in thin flesh is classed as a "choice feeder," since he gives every indication of developing into a very desirable fat animal in a comparatively short time and with the use of a reasonable amount of feed. Steers noticeably lacking in improved beef blood, as evidenced by their rangy conformation, deficient quality, and lack of uniform color and size, are termed "common feeders," as they give no promise whatever of being very acceptable to the butcher at the close of their feeding period. Between these extremes we find steers that represent the intermediate grades of "good" and "medium." Detailed descriptions of the different grades of feeder steers may be found in a number of textbooks and bulletins. Brief descriptions of the principal grades are given below:

Choice Steers: Choice grade feeders are markedly superior in conformation, finish, and quality. They are compact, wide, and deep, with legs short in proportion to depth of body. Top and underlines are approximately straight; the tail head is even with the back line and the belly is wide and deep but not paunchy. Animals of this grade have a moderate covering of fat and show considerable refinement and quality. Their color indicates that they are high grade and purebred individuals of strictly beef type.

Good Steers: Steers of this grade must show the presence of considerable beef blood, have fairly straight lines and should not be staggy. They are not as deep, as low set, or as well fleshed, nor do they show the uniform beef breeding that is characteristic of choice feeders.

Medium Steers: Steers of this grade lack noticeably the blocky type conformation of the good steers, are more uneven in their top lines, tend to be more prominent in the hips, lighter in hind quarters, and show less uniformity than the good grade. They have many of the color

Reprinted by permission from the book "Beef Cattle," published by John Wiley & Sons

characteristics of the beef breeds.

Common Steers: Common feeder steers show a marked lack of constitution and only a sembalance of the beef qualities found in the good feeders. They have rather prominent shoulders, long necks, shallow chests, and are decidedly prominent in the hips. The tail head is sharp, the rump steep, and the body is generally narrow and lacking in depth. They have some of the color markings of the beef breeds but show many of the dairy characteristics.

Numerous experiments have been conducted to ascertain the relative feeding qualities of the different grades of feeder steers, but many are of doubtful value to the practical feeder because all grades were fed for the same length of time. Consequently, either the better grades were fed too short a period to give them enough finish to sell to the best advantage or the lower grades were fed much longer than their breeding and quality warranted. Another serious criticism of most "grade" comparisons is that all grades were marketed on the same date, whereas each grade should be so fed as to insure its sale at the season of the year when prices are most favorable for cattle of that particular grade.

These criticisms do not apply to the Ohio experiments reported in Table 66. The figures in that table deserve careful study.

Table 66

Feeding Dairy and Beef Steers*

(154 Days. Six Steers per Lot. Figures on Single Steer Basis)

	Dairy Steers Holstein	Beef Steers Aberdeen-Angus
Average Age	11.5 mos.	10.5 mos.
Condition at Start of Trial	Thin	Fair market condition
Initial Weight	626 lbs.	632 lbs.
Daily Gains	2.57	2.21
Daily Ration		
Concentrates	16.50	14.80
Dry Roughage	6.60	3.80
Feed Per Pound Gain		
Concentrates	6.42	6.70
Dry Roughage	2.57	1.72
Initial Value per cwt.	$4.25	$7.00
Selling Price in Pittsburg	$8.50	$9.75
Shrinkage during Shipment	4%	5.8%
Dressing Percentage (Cold)	56.90%	60.72%

*Ohio Monthly Bulletin, Nov.-Dec., 1922

Unfortunately, the Ohio experiments were conducted during a period of rapidly falling prices. During both years cattle fed during the winter and marketed in the spring and early summer were very unprofitable. It will be noted that the common-grade steers made a much better financial showing than either the medium or choice grades. In the second test the common steers showed a profit of approximately 6 dollars a head whereas the medium-grade steers barely broke even, and the choice steers suffered a loss of about 2 dollars apiece. On the other hand, with the normal margins obtained on common, medium, and choice steers sold in April, May, and June, respectively, the financial outcome will usually favor the better grades. This is shown in the right-hand columns of Table 68. On a rising market the better grades will have a still greater advantage since low-grade steers, like cows and heifers, will not rise above the relatively low price "ceiling" fixed by the limited purchasing power of the consumers who will not buy beef if the price gets too high.

The best kind of cattle to buy depends upon the conditions under which they are to be fed and handled and the relative market price of the different grades. No hard and fast rule can be laid down for feeders to follow year after year in the purchase of their cattle. The majority of feeders should follow the conservative plan of handling cattle of average quality as represented by the good and medium grades, leaving to the more experienced and venturesome men the choice and common grades. This statement should not be applied to steer calves, the lower grades of which must be full-fed for at least 6 or 7 months before they will attain enough finish to occupy the same slaughter grade that they represented as feeders. This means that they will not be ready for market before midsummer when the price paid for choice light yearlings is frequently $1 to $3 a hundred higher than that paid for yearlings of only medium quality. Consequently, the purchase of feeder calves falling below the good grade should be avoided unless they can be purchased at an unusually low price. It should also be realized that losses from death are much larger with low-grade calves than with low-grade animals of more maturity.

Table 68

Comparison of Quality and Plain Feeder Steers When Both Grades Are Fed the Same Length of Time

	Kansas Circular 92 178 days		Nebraska* Trial for the Year 1921-22 150 Days		Univ. of Alberta* Trial for Year 1921-22 140 Days	
	Quality Steers	Plain Steers	Quality Steers	Plain Steers	Good and Choice Feeders	Common Feeders
Estimated Age	3 yrs.	3 and 4 yrs.	....	....	2 yrs.	2 yrs.
Initial Weight, pounds	1036	1199	955	925	907	879
Daily Gain	1.94†	1.90†	2.81	1.95	2.24	2.10
Feed per lb. Gain						
Grain, pounds	6.70	7.37	7.75	8.68	5.01	5.38
Dry Roughage	1.02	1.05	4.55	6.45	7.91	8.49
Silage	16.09	17.83	....	....	....	....
Pork per Steer	....	....	72	83	....	....
Initial Value per cwt.	....	....	$6.20	$4.70	$4.00	$2.75
Selling Price per cwt.	$8.75	$8.25	$8.00	$7.15	$5.71	$5.06
Per Cent Shrinkage in Shipping	2.63	3.5	....	....	....	....
Dressing Percentage	61.8	60.6	....	....	....	....

*Mimeographed Report of Steer Feeding Experiments
†Based on Market Weights

The comparative advantages of different grades of yearling and two-year-old steers are well set forth in Illinois Bulletin No. 90, extracts from the summary of which are quoted below:

1. A ration with a wide nutritive ratio and shorter feeding period tends to favor the feeding of the lower grades.
2. Well-bred steers possess greater capacity for consuming large quantities of feed than steers of a more common grade, especially in the later weeks.
3. The greater the cost of feed used, the greater the advantage in favor of the better grades.
4. As a rule, the better the quality and condition, the younger the cattle.
5. Opportunities for larger profits, and losses as well, lie with the better grades of feeders.
6. The grade of cattle of which the finishing will return the greatest profit will depend upon the following considerations:
   a. The relative cost of the various grades per hundredweight.
   b. The cost of feed.
   c. The method of feeding and time of marketing.
   d. The range in prices between the different grades

of fat steers at the time the cattle are sold.

7. The better the grade of cattle the higher the percentage of dressed beef.
8. Low-grade cattle carry larger percentages of internal fat than the better-bred ones, while there appears to be a more abundant and more evenly distributed layer of surface fat on the better-bred steers.

Data gathered by the United States Department of Agriculture and the University of Illinois in De Kalb County, Illinois, during the winter of 1922-23, throw further light upon the feeding qualities of plain and well-bred cattle. These figures are the result of records kept on the feeding operations of some forty practical cattle feeders, who handled their cattle according to their usual methods of management. It will be observed that the good steers were on feed a full month longer than those grading common, but that, notwithstanding this fact, the gains of the former were both larger and cheaper for the entire time they were fed. These results tend to refute the claim sometimes made that the daily gains made by common steers during a short, "warming up" feed are as large and as economical as those made by better animals over a longer period.

Table 69

Comparison of Good and Common Steers under Actual Farm Conditions*

	Good Steers	Common Steers
Number of Droves	15	26
Number of Cattle	703	1785
Number of Days on the Farm	174	143
Purchase Weights	888 lbs.	824 lbs.
Sales Weights	1186	1013
Gain in Weight	298	189
Average Daily Gain	1.71	1.32
Feed per cwt. Gain		
Grain and other Concentrates	695	724
Silage	1261	1871
Dry Roughage	327	467
Pasture Days	9	8
Purchase Price per cwt.	$7.00	$5.13
Sale Price per cwt. (at farm)	$9.07	$7.16
Necessary Margin to Break Even	$1.52	$1.99

*U. S. D. A. Mimeographed Leaflet, "Two Steers on the Same Trail." November, 1924

The Feeding of Inferior or Scrub Cattle.— As a rule, the common grade represents the cheapest class of cattle regularly taken out into the country for feeding purposes. While noticeably lacking in form, quality, and breeding, these common feeders do not usually show pronounced scrub or dairy blood. Instead, they are animals of rather nondescript breeding, usually in very thin flesh, but still possessing a fair degree of thrift and vigor. As a rule, one would not say that they had been badly stunted, although, the age of any individual steer of low grade is largely a matter of conjecture.

Steers that will not qualify for the common grade are classed as "canners" and are sold to the packers for slaughter. They appear on the market in greatest numbers in the late fall and early winter when the shortage of pasture necessitates the sale of all cattle for which winter feed is not available. Coming to market at the time of year when there is an abundance of cheap, grass beef, these "trashy," "dogie" cattle sell for an extremely low price. This low price has during recent years induced a number of experienced feeders to buy these cattle for the purpose of taking them to the country for a short feed and returning them to market during the late winter and early spring when the supply of cheap beef is of much smaller volume. The demand for steers wholly lacking in beef type for feeding purposes is not large, and it occasionally happens that they can be bought for a price as low as 30 or 40 per cent of the cost of good to choice feeders. When purchased on such a basis, the profit made from their feeding may be even greater than that made from feeding the higher-priced cattle. Particularly is the return per dollar invested likely to be higher.

There are some objections to handling "cull" steers. In the first place, such cattle bought on the open market vary greatly in age, feeding habits, and previous methods of management. Some of them will be steers four or five years of age that have been permanently stunted; others will be yearlings in very thin flesh. Some will be accustomed to eating corn; others will never have tasted it. Some will be cattle of poor breeding that have had fairly good feed conditions; others will be better-bred animals that have been almost starved. Naturally, all will not do equally well or finish evenly when placed in the same feed lot.

The general thrift and health of such cattle is relatively low. Death losses are apt to be considerably higher than in the case of ordinary stock. Most of these animals are horned, and dehorning further increases the death

risk. While the death loss in handling ordinary feeders seldom exceeds one per cent, it frequently is twice or three times this amount with cheap, "dogie" steers. More than ordinary skill is required in handling and feeding cattle of this sort, if good results are to be obtained. As a rule, they are not a safe proposition for the inexperienced feeder.

One of the chief objections to feeding low-grade and cull steers is the effect they have on the morale of the owner. Most livestock farmers take a great deal of pride in the appearance of their animals and derive considerable satisfaction from seeing them develop into acceptable market beasts. To top the market with a load of prime steers is frequently more gratifying to the real cattle feeder than the realization of a larger profit made from a drove of inferior cattle. The presence of the latter animals in the feed yards is regarded as an "eyesore" to the farm. Not infrequently, men who consider cheap cattle more profitable than the better grades, also feed out each year a load or two of as good steers as they can buy, possibly for the purpose of preserving their own self-respect and maintaining their reputation as good cattlemen who know a superior beast when they see it.

The above is an excerpt from Beef Cattle by Roscoe R. Snapp, which we recommend as an excellent book on Beef Cattle. It is published by John Wiley & Sons, Inc., and for the convenience of our readers it may be purchased through the Farmers Digest.

Poultry House Temperatures

Reprinted from New Jersey Agriculture

H. E. Besley

Assistant Professor of Agricultural Engineering

MOST poultrymen agree that abrupt temperature changes or temperature extremes, either high or low, in poultry houses have an adverse effect on egg production. There is, however, marked disagreement as to the merits of the methods commonly recommended to control temperatures. In an effort to shed some light on the question, the Agricultural Engineering Department has been making observations for three years to determine the effect of roof treatment and insulation on temperatures in open-front type houses. The possibility of using auxiliary heat during cold weather is also being investigated.

Six 10′ x 12′ open-front poultry houses are being used to compare roof treatments. The first house, the check, has regular black roll roofing over the seven-eighth-inch yellow pine roofers; the second has outside white paint applied to the black roof; and the third aluminum paint on the black roofing. The fourth has galvanized iron placed over 1 inch of commercial insulating board on the roofers; the fifth, galvanized iron over the old black roofing; and the sixth, galvanized iron nailed directly to the rafters. Maximum-minimum and regular mercury thermometers are used to measure results.

Tests indicate that roof treatment has no appreciable effect on the air temperature in the houses during cold weather. The difference between any two houses was never more than 2 degrees F. with all windows closed.

In hot weather, the temperature taken within a few inches of the roof was frequently 5 degrees and in rare instances as much as 8 degrees higher in the house with a black roof than in the ones covered with white or aluminum paint. Galvanized iron over the old black roofing gave about the same results as the white roof, and bare galvanized iron about the same results as the black roof. Temperatures under the insulated roof were generally 1 or 2 degrees but never more than 4 degrees lower than those under the white roof. The temperature differential among the various

Reprinted by permission from New Jersey Agriculture, New Brunswick, N. J., July-August, 1939

houses decreased as the distance below the roof increased. At the level of the birds one foot from the floor, the differential between any of the houses was never more than 3 degrees.

Excellent cross ventilation in the houses was provided by openings between the rafters at the rear plate, by one side window, and by the open fronts. It was apparent in the tests that most of the heat coming through the roof was dissipated before reaching the bird level.

To check the value of window ventilation, the pen with the white roof was closed, causing a temperature increase of as much as 6 degrees at the level of the birds within an hour. In standard 20′ x 24′ New Jersey open-front laying houses insulated with one-half inch of commercial insulating board, the air in the house with windows open on all four sides was as much as 14 degrees cooler than that in one with all windows closed and as much as 5 degrees cooler than that in one with windows open only on the front. The outside temperature ranged between 85 and 90 degrees.

The importance of cross ventilation was illustrated one very hot humid day in two pens of a multiple unit laying house. The front windows are high in these pens, and no rear windows are provided. When the observation was made the temperature in the pens was 100 degrees. In one pen an 18″ x 44″ opening was made in the rear wall at floor level and covered with poultry netting. Within half an hour the air temperature at the bird level in the pen dropped 4 degrees, whereas that in the adjoining pen remained the same. Later observations show that air temperatures at bird level in pens with cross ventilation are only 1 to 3 degrees lower than those in other pens without cross ventilation. The birds appear more comfortable and are more active, however, in the pens where air moves across the floor.

It is not the purpose of this article to discredit insulation, but it is difficult to show the value of insulation for summer use in open front type construction as clearly as the value of air circulation. Either with or without cross ventilation, the air temperature at bird level in houses that had as much as 1 inch of commercial insulating board on the ceiling and one-half inch under the regular siding or on the partition wall was never more than 3 degrees cooler than that in uninsulated houses.

During cold weather, when it is desirable to conserve heat, the benefits derived from good construction and insulation are more evident, particularly if auxiliary heat is used. Some tests

to compare uninsulated, insulated, and insulated and heated pens were initiated in February, 1936. Insulation consisted of one-half inch commercial insulating board on the inside of studdings and rafters. The air movement in these pens was regulated by closing all windows and forcing through each pen an equal quantity of air, which at the beginning of the tests amounted to one-seventh air change an hour. The heated pen had a 600-watt screw base, cone type electric heater, fitted into the air supply pipe. A thermostat set to operate at 32 degrees was used to control the heater. During February and March heat was required on ten nights, the average energy consumption was 3.43 kilowatt hours a night, and the average minimum temperature was 30.7 degrees in the heated pen, 24.8 degrees in the other insulated pen, and 16 degrees in the uninsulated pen. During the time the heat was required the average maximum outdoor temperature was 20 degrees and the average minimum was 10.2 degrees. On the two coldest nights, when the outdoor temperature dropped to 3 degrees, the minumum inside temperature was 30 degrees in the heated pen, 18 degrees in the other insulated pen, and 12 degrees in the uninsulated pen.

For the winter of 1937 an additional one-half inch of insulation was placed on the ceilings of the two insulated pens, and a ventilating flue 14″ x 16″ was built in each of the three pens to aid in the removal of odors and moisture. Thermostatically controlled electric heat was used in both insulated pens, one thermostat being set to operate at 40 degrees, the other at 32 degrees. During the 90-day period December 15 to March 15, heat was required in the 40-degree pen for some part of 50 days with a total energy consumption of 257.4 kilowatt hours, whereas in the 32-degree pen heat was required during part of only 12 days with a total energy consumption of approximately 30 kilowatt hours. The relatively few days heat is required in order to maintain the temperature above freezing in an insulated house is significant.

Air movement in all three pens was increased, for the second year's work, to approximately two air changes an hour, or approximately one cubic foot per bird per minute. On checking the temperature curves for the three pens it was noted that the uninsulated pen was generally 4 to 5 degrees warmer than the outside temperature, whereas the insulated pens remained about 8 degrees higher when heat was off. The auxiliary heat maintained the minimum temperature in the insulated pens at about the thermostat setting; otherwise, the

temperature fluctuations in all pens followed outside changes. This was undoubtedly because too little heat was given off by the birds to warm the relatively large volume of air that was continually circulated through the pens.

Such tests give some idea of the value of insulation when auxiliary heat is used. It is generally agreed that one inch of commercial insulating board is about the minimum that should be used. If the use of only one-half inch is contemplated, it is probably better to provide double wood walls and omit the insulation. The insulation should be placed on the outside of the studding next to the siding to avoid trouble with rodents.

Color and Quality in Apples

Condensed from The Rural New-Yorker

Lawrence Southwick

COLOR is one of the important factors determining the grading of a red apple. Many thousands of bushels of apples fail to meet the requirements of Extra Fancy, Fancy or A because of insufficient color development. The loss of thousands of dollars results each year just because the red color desired by consumers everywhere fails to make its appearance in sufficient quantity or quality.

The color changes in apples as they develop on the tree are twofold. First, there is the ground color change. In green varieties, such as R. I. Greening, there is a gradual color development from the dark or leaf green to a very light or yellow green as the fruit matures. In red varieties, such as McIntosh, this same change is readily seen in the shaded portions of the fruits. Secondly, there is the over-color change as seen in the development of the red blush typical of red varieties. It is this latter color development with which we are concerned here and which is so vital to every orchard enterprise. The consuming public has been educated to want and to demand rich color in red apples. Experience has vindicated the reasonableness of this sentiment. The chemical changes that foster good color formation are the very changes that bring to maturity fruit that is high in flavor, aroma and palatability. It is readily apparent, then, that proper color development should receive the concentrated energies of every grower.

It seems almost paradoxical that, even though the importance of color has long been recognized

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and has been brought very conspicuously to the front in recent years, research has not been able to fully fathom the "why" of the apple blush. Nevertheless, many things are known, some of which have very practical application. For instance, Magness found some years ago that sugar content and "associated chemical changes"—determined by stage of maturity—and the presence of ultra-violet light were particularly influential in color development.

The general need for sunlight has been recognized for a long time, but only in recent years have certain specific facts come to light. In an experiment in the State of Washington, green apples were picked and placed both under glass and in direct sunlight. After five days the percentages of color formation on Jonathan and Delicious apples were 8 and 31 percent respectively and after 12 days, 30 and 85 per cent. Quite recently at the Boyce Thompson Institute for Plant Research in New York, Arthur used colored glass filters and definitely proved that the ultra-violet, violet and blue regions of sunlight (in contrast to the orange, red and infra-red) were the most valuable in producing color. These findings largely account for the fact that fruit grown at higher elevations tends to color well and also explains the tendency of fruit to color rapidly after rains. The important ultra-violet rays of sunlight tend to be absorbed as they pass through the air by moisture and dust particles. Hence their concentration is highest at high elevations and progressively decreases down to sea level. And again, after a rain has cleared the air, the percentage of ultra-violet rays that reach the earth at any one location may be significantly increased.

Fruit sugar content is almost as important to color development as exposure to light. It has been observed many times that apples having an excellent light exposure but a low sugar content rarely develop the best color. If color is developed, it usually will be a dull bronze unattractive red instead of the desired bright blush. There seems to be a close relationship between sugar content and anthocyanin or red pigment development. Fruit that is likely to be low in sugars may be found on weak trees. Inadequate leaf area for manufacturing the starches needed to build up the fruits may result in a shortage and often the fruits suffer. In short, demand exceeds the supply. Obviously, proper tree invigoration would be required in such a case. On the other hand, excessively high nitrogen trees are apt to turn out poorly colored fruits because of the unbalanced condition of nutrition and because insufficient light

reaches the apples due to the luxuriant leaf and shoot growth. Here, a more equitable soil management and fertilization program leading to lower available nitrogen in the latter part of the season, together with proper pruning would be corrective measures. Putting an over-vegetative orchard in sod can usually be relied on to enhance the "finish" of subsequent crops.

Then there is the question of too much and too little available moisture. Either extreme seems to affect color adversely. A surplus of water during the ripening period is likely to result in poorly colored fruit. This has become evident in orchards under irrigation. Under drought conditions, the area of colored surface may not be greatly reduced, but the quality of the color is often poor. A dull and lifeless red is a poor substitute for the lively bright red of normal and well-grown apples.

High yields often delay maturity and, consequently, color development. This has led to the well-known practice of color-picking which is particularly useful with varieties like McIntosh with the pronounced pre-mature dropping habit, as well as with sorts like Jonathan and Cortland which are prone to over-maturity troubles. Caution must be the watchword when it comes to picking red-bud sports of our common varieties by the color criterion. In these cases it is easy to become over-optimistic and harvest fruit whose appearance belies its condition of maturity. Probably, for proper development of eating quality, a red-bud sport needs just as long a season as the variety from which it came. Undoubtedly, in future orchard plantings red sports will assume increasing importance. It is hoped that the increased ease of obtaining color will be accompanied by good judgment as to time of harvest so that all of the other attributes making up quality are duly taken into consideration. Only in this way will the desirable association of color with excellence of quality be maintained.

The chemistry of the red color changes is only partly understood. It has lately been found that the unseen coloring matter in "green" red varieties is acted upon chemically and changed to red idaein or, technically, 3—galactosidylcyanidin. Until this change takes place red color development is prohibited. Hence, in certain "strains" of a variety this change is brought about sooner than in other strains. It is also known that development takes place only in living cells and that usually a blush is only skin deep. Detached pieces of live green apple skin will develop red color under proper conditions of ex-

posure and moisture. But following periods of storage, the skin cells usually die and such fruits will never take on color, even under conditions fostering such development.

From what has been said, it is at once evident that apples need not be attached to the tree to develop color. Many fruit growers know that "drops" will color if allowed to remain under the tree for several days. In many cases it has seemed that color development actually has been speeded up following either natural abscission or artificial removal from the tree. Usually, however, under ordinary commercial handling conditions, apples are removed from direct light exposure shortly after picking so that most of the crop is never given a chance to increase the amount or the quality of the red blush.

In recent years some experimental coloring of fruits before, during and after harvest has been done by Experiment Stations and also by a few individual growers. In the East, McIntosh and Northern Spy have been used to a large extent because of the tendency for these important commercial varieties to color poorly under conditions favoring high production, especially in some years. Hoffman's results at Ithaca indicate that picked apples will develop "very satisfactory color with a rather low total light intensity provided a relatively large proportion of the light is made up of the short wave lengths containing the ultraviolet." This finding illustrates the fallacy in old methods of exposing detached fruits to the direct rays of the sun without shading. Severe scalding was often encountered.

Hoffman devised a coloring method which any fruit grower can use effectively under the right conditions. On a shaded site a frame consisting of a roll of ordinary poultry wire four feet wide and 100 feet long is stretched across 18-inch supports. If the frame is in the open, a shade consisting of at least three layers of cheesecloth or its equivalent is stretched over the top about 18 inches above the fruit. Such a frame will accommodate 50 bushels of apples. McIntosh, green at harvest time, will develop fancy color after a few days on this frame. The exact length of time will depend largely on weather conditions. With white oilcloth stretched on the ground under the frame, even the under surfaces of the fruits will turn red due to reflected light. From 100 to 500-foot candles is believed sufficient for proper color development provided the light is of the desired quality, as explained above. It is further interesting to note the general absence of ill-

effects on the frame-treated fruit as measured by the amount of wastage and the quality of the apples upon removal from storage months later. Hoffman estimated that 10 cents per bushel would cover the cost of the complete coloring operation. Others have made estimates considerably under this figure. Considering a relatively small total cost, the treatment is justified if lack of color is the only factor lowering the grade and if the price differential between grades is real.

Some growers have tried after-harvest coloring by placing the green and poorly colored fruits in a single layer on mulch under the trees. The approximate time required for good development of color averaged 10 days under these conditions in several actual cases, and the value of the fruit was always markedly increased. It should be borne in mind, however, that such long exposure to average orchard temperatures at that time of year may materially reduce the storage life of the fruit. Other possible drawbacks of this "ground-ripening" method are the increased chance for insect (especially cricket) or mechanical injuries incident to extra handling and the possibility of variable results due to different light conditions under individual trees. Provided these factors are not over-troublesome, the method does have the important advantage of simplicity. In experiments in Ohio last year, the mulch system actually seemed the more practical method with McIntosh, Spy and Delicious. "Bright" mulch material is recommended if this system is to be used.

New Serum Developed

FARMERS all over the world will welcome a report from Copenhagen that a serum has been discovered which will render cattle immune from foot and mouth disease.

Existing sera have saved cattle for only ten days, but this new treatment has been proved potent for nearly a year, and up to 97 per cent of the cattle have been immune from infection.

In scientific circles in Copenhagen it is claimed that Dr. Svend Smith, a Danish Government scientist, has really finally conquered foot and mouth disease, which has caused the world millions of dollars of loss.

Experiments have been carried out in Germany and many thousands of cattle have been saved. There are three known types of foot and mouth virus and it is not yet known if the serum is effective against all three.—*Shorthorn World, July 25, 1939*

Domestic Rye Grass

Condensed from Eastern States Cooperator

GREEN manure crops are thoroughly presented in Bulletin No. 653 of the New Jersey Experiment Station entitled "Soil Organic Matter and the Living Plant." In reference to green manure crops this bulletin states:

"Without organic matter there is no true soil but only a mass of disintegrated rock debris or soil material. Organic matter improves the physical condition of the soil by increasing its moisture-holding capacity, by favoring better aeration, and by creating a better soil structure. It results in loosening compact, heavy, clay soils and in binding together loose, open, sandy soils, thus improving the texture. Organic matter aids in preventing soil erosion, both by wind and by water. It improves the chemical condition of the soil, by serving as a storehouse of plant nutrients and by rendering some of the inorganic elements more readily available to the plant, thus making the soil more fertile. Organic matter improves the buffering capacity of the soil; that is, its ability to avoid rapid changes in reaction. It also serves to correct toxic soil conditions which may result from the use of excessive amounts of artificial fertilizers or from the presence of spray residues and similar materials. It improves the soil as a medium for the growth of beneficial microorganisms, which bring about numerous changes important for plant nutrition. Conservation of the soil humus is, therefore, of the utmost importance for the preservation of soil fertiliy and profitable crop production."

Sudan grass constitutes one of the most desirable green manure crops for a summer seeding (June 1 to July 25) where the field can be used for this purpose throughout most of the growing season. It requires a firm seedbed for most satisfactory germination.

Domestic rye grass we have found to be a most desirable green manure crop when seeded in the last cultivation of row crops such as sweet corn, field corn, tomatoes and other late maturing row crops. The seed does not require much covering and germinates very readily, even in a relatively loose seedbed. The rate of seeding varies greatly among practical farm operators from as little as 10 or 15 pounds to as much as 80 to 100 pounds of seed per acre. One of the most successful market gardeners in the Springfield area, the late August Kastner, of Agawam,

Reprinted by permission from the Eastern States Cooperator, Springfield, Mass.

Massachusetts, who obtained a good livelihood from 10 acres in the production of vegetables and flowers, followed the practice for many years of seeding 80 pounds of rye grass seed per acre after the removal of an early season cash crop, such as early cabbage, and frequently used it after harvesting strawberries, disking or plowing the field and seeding about the last of July or the first week of August. Within eight to ten weeks (early October) he could produce over three tons of dry matter per acre in this green manure crop. An actual determination made from one square foot of Domestic rye grass sod collected from Mr. Kastner's field in October, 1936, and analyzed by a member of the Massachusetts State College staff showed a weight of 5089 pounds of dry matter per acre in the tops and 1632 of dry matter in the roots to a depth of only six inches; or a total of 6721 pounds of dry matter per acre produced from August 5 to October 1.

Mr. Kastner frequently remarked that when plowing Domestic rye grass he found it as tough as an old Blue grass sod.

Domestic rye grass offers an excellent medium to control erosion and should be brought to the attention of everyone interested in agricultural conservation.

Sanitary Care of Milking Machines

Condensed from The Jersey Bulletin

J. L. Henderson, C. L. Roadhouse and A. Folger
University of California

IMMEDIATELY after milking, the surfaces of the rubber parts of the milking machine should be rinsed before the milk solids have dried upon them and become difficult to remove.

Cold or lukewarm water should be used for this first rinse because hot water would cause the milk proteins to adhere to the surfaces of the rubbers and render proper cleaning difficult. The best practice is to make this cold rinse a part of the milking procedure and to draw 1½ to 2 gallons of clean cold water through the machine by vacuum immediately after the last cow has been milked. An air-brush effect can be secured by alternately lifting the cups out of the water and then immersing them in a pail of water while the vacuum remains connected. Machines that do not have long milk tubes and claws cannot be so rinsed; and it is recommended, therefore, that immediately after the last cow has been milked a machine of this type be taken to the milk house,

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where the rubbers should be disconnected from the pail and placed in a tank or pail of cold water.

Hot water at a temperature between 165° and 170° F. should next be drawn through the machine by vacuum. This second rinse of 1½ to 2 gallons of water is used to remove the remaining milk. The water should be drawn through the machine by continuous rather than intermittent suction. If no vacuum connection is available in the milk house, a vacuum may be drawn on the pail in the barn after the cold water rinse, and the pail then removed to the milk house, where hot water may be drawn through the rubbers by the vacuum remaining in the pail.

The hot water rinse is very important in cleaning milking machines because it removes most of the adhering milk fat. At the temperature used for sterilization, rubber quickly absorbs any fatty substance, and its tensile strength is thereby reduced. In consequence, the life of the rubber parts is materially shortened when the hot rinse is not used.

After the milk has been thus removed from the surfaces, the remainder of the cleaning process may be delayed without detriment.

Brushing the rubber parts is the third step in the proper cleaning of milk machines. For this purpose, a two-compartment washing and rinsing tank is recommended, and warm water containing washing powder should be used. With the claw-type machines, the short milk tubes and short air tubes should be disconnected from both the claw and the metal teat cups, and a brush passed through them after each milking. The teat cups and the long milk tubes should also always be cleaned with brushes of appropriate size.

Metal cleaners for milk tubes, resembling ramrods with a bur at one end, may be used in place of brushes in cleaning the long and short milk tubes. The metal cleaners are especially useful if the brushes have been permitted to become worn or have not been kept in a sanitary condition.

With some types of machines, the inflation rubbers should be removed from the metal casings after each milking; with others this may be done once a week, when the insoluble material that may have accumulated around the ring may be removed and the inflation rubbers trimmed to the proper length, if necessary, and reversed in the metal casings. In any case, the insides of the inflation rubbers should be thoroughly brushed and washed after each milking and should then be rinsed in clean, warm water to remove the cleaning solution. The metal parts (i. e., the head, claw,

and pail) must also be thoroughly washed and brushed after each milking.

A uniform daily procedure in cleaning the milking machines will facilitate the work and insure a thorough cleaning.

Sterilization is the next and most important step in the procedure of producing milk of low bacterial count when milking is not necessarily bacteria-free, sterilization is necessary to destroy the bacteria which are liable to be present in dairy equipment.

The metal parts are easily sterilized by steaming them in a sterilizer or by immersing them in boiling water. Rubber tubes and inflation rubbers, however, will deteriorate rapidly when held at a high temperature for a long time. "Sterilization" as usually applied to dairy equipment refers to the destruction, either by heat or by chemicals, of most of the bacteria present in the equipment after washing. Both heat and chemical sterilizations have been investigated by the authors as to the efficiency and reliability of the two methods in destroying bacteria and the effect on the life (period of usefulness) of rubbers.

Heat sterilization was found to give consistently the lowest bacterial count and to be the most reliable method of sterilizing milking-machine rubbers when the temperature and time of holding were observed.

It was shown that heating the rubbers to a temperature of 185° F., holding them for 20 minutes, in the heating tank without applying additional heat, and then draining out the water, gave the lowest bacterial counts and did not materially shorten the life of the rubbers as compared with heating at lower temperatures. This comparison was made by sterilizing the rubber tubes at 170° F. for 20 minutes. Lower temperature of heating is not so satisfactory because of the additional attention required to keep above the minimum requirement of the law, and the bacterial content of the rubbers was somewhat higher thereafter. The life of the inflation rubbers was 9 weeks with the lower temperature of heating, that of the short milk tubes, 19 weeks.

When the rubber parts were heated to 170° F., held at that temperature for 20 minutes, and left in the water to cool gradually between milkings, their bacterial content was considerably increased, the life of the inflation rubbers on the average was decreased 1 week (i.e., from 9 to 8 weeks), and that of the short milk tubes was decreased 9 weeks (i.e., from 19 to 10 weeks). In addition, thermophilic bacteria developed in the water and caused objectionable additional contamination.

The container in which the rub-

bers were heated was a galvanized tank 50 inches long, 12 inches wide, and 12 inches high, fitted with a sloping tray which held the rubbers in a slanting position so that no air pockets would occur in the long milk tubes and which permitted them to drain out well when the water was removed from the tank. The water was heated by means of a steam pipe that ran the length of the tank and which was provided with numerous holes at regular intervals along its underside, thus assuring uniform heating of the water. After the water was drained out, the rubbers were left in the tank between milkings in order to protect them from flies and dust. When the rubbers are placed in an ordinary wash boiler or milking pail for sterilization, they may afterwards be hung in the refrigerator or in a cabinet to protect them from contamination. For successful heat sterilization, an accurate thermometer must be used each time the water is heated. The rubbers should not be left in the water too long, or they will lose their elasticity.

An accurate thermometer should be used to determine the temperature of heating for each sterilization. In large dairies, a recording thermometer may be installed in the heating tank. this serves as a check upon the work of employees and should give more satisfactory results.

Chemical sterilization is not acceptable for the treatment of milking-machine parts or other dairy apparatus in California unless it is accompanied by heat sterilization. Experience has shown, and the experiments conducted by the writers support the conclusion, that heat sterilization as recommended gives very satisfactory results; the use of chemical sterilization, in addition, is therefore unnecessary.

Results indicate that chlorine solutions of proper strength are excellent for sterilizing clean metal or rubber surfaces. One must remember, however, that crevices form in rubbers which have been used for some time and provide a lodging place for milk solids. These solids combine with chlorine and render it ineffective in the destruction of bacteria. A chlorine solution, furthermore, loses its strength readily in the presence of milk solids, in sunlight, and at warm temperatures. Hence, unless its strength is protected, its efficiency in destroying bacteria cannot be depended upon. The solution should be frequently tested for available chlorine in order to determine its sterilizing value.

During the warm summer months the chlorine solution may lose its strength so rapidly that bacteria in the rubber tubes are not destroyed. At such times, the

strength of the chlorine solution may well be doubled at the time it is prepared, since this precaution has proved effective in avoiding irregularities in the bacterial content of the rubbers.

One investigator has used sodium hydroxide or lye solution as a satisfactory chemical sterilizing agent for milking machines. Our results with the use of this chemical show that sodium hydroxide of 0.4 to 0.5 per cent strength will kill most of the bacteria present in milking machine rubbers but that the bacterial content, on the average will be somewhat higher than when chlorine solution is used of a strength of 200 parts per million. Lye solutions should not be used on machines having aluminum parts.

The bacterial counts of the rubbers sterilized by the recommended heat method averaged 3 bacteria per cubic centimeter of rinse water, while chlorine sterilization averaged 45, and sodium hydroxide averaged 148.

The life of milking machine rubbers depends on many factors, such as quality and age of rubber, number of cows milked per day, number of sterilizations per day, treatment during sterilization, thoroughness of cleaning the rubbers, and size of teats of cows milked. In the investigations referred to, factors influencing the life of rubber parts were kept as constant as possible. When the recommended method of heat sterilization was used, and the cows were milked twice a day, the teat-cup rubbers had a life of 8 weeks, the short milk tubes 16 weeks, the short air tubes 23 weeks, and the long milk tubes 46 weeks. When the rubbers were sterilized twice a day with the chlorine solution, the teat-cup rubbers lasted 13 weeks. Chlorine sterilization of the machines used three times a day resulted in a life of 11 weeks for the teat-cup inflations, 14 weeks for the short milk tubes, 31 weeks for short air tubes, and nearly a year for the long milk tubes. The life of the long milk tubes depends largely upon the number of times they are stepped on by the cows and the number of times the ends are trimmed. Chlorine and sodium hydroxide sterilizations are almost equal in their effect upon the teat-cup inflation rubbers.

Cooperative Grape Association

Condensed from Pennsylvania Farmer

Charlotte E. Watson

SINCE its founding, April 19, 1921, the Keystone Cooperative Grape Association of North East, Erie county, Pa., has been in continuous operation. It is incorporated under the laws of Pennsylvania relating to cooperative associations.

Then, as now, certain progressive farmers in the community realized that as members of this association they would present a strong and unified front in those highly competitive markets to which as individual producers they had previously been offering their fruits and vegetables. They knew quantity purchases by the association would net lower prices to them for the commodities they needed for the operation of their farms. It would result in greater financial strength, mean additional borrowing power if it were needed.

To finance the original investment for buildings and equipment, bonds were sold to North East farmers and business men. As the association grew and expanded, these bonds were redeemed. In the beginning, additional funds were obtained from local banks, using members' notes which were pledged as collateral.

Each year each member is required to leave on deposit with the association a little more money than it actually costs the association to sell his crops for him. For instance, if the actual cost to the association of selling a ton of grapes is $1.50, a like amount is left by the member as a deposit in the revolving fund. This money is called a retention fee and a formal receipt for it, called a Certificate of Interest, is issued to the individual member to show that the association owes him this money. As the years went on, more money was deposited by the members than the association needed for running its business, even after establishing the proper and necessary reserve funds, and after buying back the original issue of bonds. When this condition occurred, and there was a surplus on hand, the association repaid those depositors who had first contributed to the revolving fund the money which they had deposited the first year. Each year, thereafter, as the association prospered, new deposits were made and the earlier deposits were repaid in the proper order.

The revolving fund at this time stands with the depositors during the year 1930 and all depositors

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prior thereto repaid, in cash, in full. Depositors of record for the year 1931 have been repaid for three-quarters of what they deposited that year. All deposits from then on, up to date, are at present being used to run the business. As of January 1, 1939, there is $38,417.41 in the revolving fund.

Reduced to a per acre basis, each member now has an average cash investment in the association of $9.72 for each acre of crops sold through the association during the last six years, or an average of $1.62 per acre per year which each member has deposited in the fund.

There are 315 members in the association as of May 29, 1939, and there are 41 farmers who are not members but who use the association services. These nonmember farmers do not have a member's privileges nor are they entitled to any rebates, discounts or participation in the various commodity pools at the prices of paid members.

The association performs various services for its members. First, it packs and ships various fresh fruits and vegetables including grapes, apples, tomatoes, prunes, plums, berries, cherries, etc. Second, it cans, preserves and cold packs all the above named fruits and vegetables. And as a help in these canning operations, it grows tomato plants for the use of its members. This year the association has 850 acres of tomatoes under actual contract. Third, the association buys and sells for its members' use all farm supplies which they need for the operation of their farms. These supplies include fertilizers, spray material, gasoline, oil, baskets, cartons, etc. Also, the association manufactures baskets for its members' use and carries a stock of crates and other packages. Fourth, the association assists each member by extending reasonable credit for supply purchases during the entire growing and harvesting season. Fifth, the association does all in its power to promote proper farming practices and to assist its members, by disseminating such knowledge as it has at its command, in growing better and larger crops.

To become eligible for membership, one must first be actively engaged in farming; second, he must decide how many acres of crops he wishes to sell through the association and fill out a crop estimate report. Then he must sign the marketing agreement covering his crops. A membership fee of $5 in cash must be paid. And last, based on the number of acres for which a member has signed up, he gives a membership collateral note in the amount of $25, plus $10 for each acre of crops for which he has signed.

The $5 membership fee covers

the cost of enrolling that member's name, of issuing a membership certificate, of opening the various accounts and files which will be needed to keep a complete record of the member's business.

The membership collateral note is simply pooling one's credit with that of the other members to provide assignable borrowing power for the association. It is not interest bearing. It is not callable nor collectible unless the association goes bankrupt. It is returned to the member immediately if he resigns and owes nothing to the association. Resignations may be made during December only of any year. The note is in reality only concrete evidence that a producer is supporting the association and is acting in good faith.

The benefits of the association are many. A member will buy his farm supplies at real savings. Reasonable credit is extended throughout the growing and harvesting season. One can ask and obtain sound advice and help with his farm problems. He is assured fair returns for his crops, and prompt payment. He does not face the chance of getting nothing whatever as is the chance he takes with a private buyer or canner.

In the case of commodities delivered for canning or processing, all like commodities are pooled. The grower receives, at the time of delivery, 50 per cent of the then market value of his products. As the raw material is converted into finished canned goods and passes into storage and finally is sold, additional payments are made to the grower depending on how fast the goods move. When all finished goods are sold, final payment is made to the grower. In the case of commodities shipped as fresh fruit, the member is paid in full as soon as his deliveries are sold by the association.

When the tomato pool for any given year is finally liquidated, the total expenses of canning and selling the pack are deducted from the gross amount of money received for the pack. This net amount of money remaining is then divided on a tonnage and grade basis to determine the per pound price. This, then, is the price the grower will receive for his commodity. Prices paid for commodities shipped as fresh fruit are the actual prices the association received less exact expenses involved. A member will be called upon to deposit a certain percentage of this money with the association as his contribution for that year to the revolving fund, the fund from which the association gets its money to operate.

White Top, Enemy Number One

Condensed from The Reclamation Era

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WHITE TOP (Lepidium draba) is one of the most pernicious perennial weeds found in the western United States. While it is exceeded in acreage by several other weeds, yet, in most States, it is considered "weed enemy number 1" among the list of troublesome plants which cause large losses to farmers in this area. Throughout the Rocky Mountain and West Coast States, White Top has completely taken over large areas of fertile soil. Owing to its habit of growth it is extremely difficult to eradicate and grows so abundantly as to smother out crops which are planted on infested lands.

White Top is one of many weed immigrants which have been transplanted from foreign soils through imports of seeds and other commodities. The plant is a native of central Europe and western Asia and sometimes is known as hoary cress, white weed, or Turkestan mustard. Its early history in the United States is somewhat obscure. However, the first infestation which can be definitely traced originated from a lot of alfalfa seed brought east from a California port by wagon freight during the middle of the nineteenth century. The story told is that a freighter reaching a small Utah settlement was faced with financial difficulties and bartered several bags of alfalfa seed in payment of his debts. From these original seedings the weed has spread widely through the West. Doubtless this is but one example of the many infestations brought in through impure seedstocks.

White Top spreads very rapidly by creeping roots, and small patches may become large within a few years. It seeds very heavily and its seed, besides having a high vitality, may lie in the ground for many years, to germinate and produce plants only when conditions become favorable for germination.

White Top is one of the earliest weeds to start growth in the spring and reaches the bloom and seed stage in most areas by the forepart of June. For this reason first cutting alfalfa infested with White Top usually will contain much mature seed which, when fed to livestock, will further

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spread the weed through manure and droppings. Water, birds, and machinery likewise have aided in giving this pest a wide distribution throughout the Western States. A number of instances have been noted where isolated uncultivated islands in streams and lakes have become infested with White Top by migrating birds, especially wild ducks.

White Top is a member of the mustard family Cruciferae, of which there are a number of common weeds such as the common pepper grasses and wild radish. The family is characterized by the cruciform flowers composed of four somewhat similar petals abruptly spreading in the form of a cross, and its two-valved seed pod. The flowering branches bear clusters of small white flowers on very slender stems. The whole flower head has a flat-topped appearance. The seeds borne in great numbers in two-valved seed pods are dark reddish-brown, flattened, and about the size of alfalfa seed; rounded at one end and narrowed to a point at the other. The root system consists of well-developed large white rootstocks which penetrate to a depth of several feet and spread horizontally in all directions. The plant lives over winter by storing food in the rootstocks which allows it to produce new plants from each root joint the following year. Like other members of the Cruciferae family the plant has a pungent or mustard taste which is readily distinguished.

There are two other closely related plants, equally persistent, and which usually are mistaken for White Top as they often are found growing together. These plants are *Lepidium repens* and *Hymenophysa pubescens*. They can best be distinguished by the shape of the seed pod; *Lepidium draba* having a heartshaped seed pod, *Lepidium repens* a lens-shaped seed pod, and *Hymenophysa pubescens* a globe-shaped seed pod. In some cases the latter two have been found considerably more difficult to eradicate especially with chemical treatments.

The control of White Top is both a difficult and expensive undertaking. Yet land once infested, unless properly cared for, soon becomes unprofitable and greatly reduced in value. A number of methods are used for control and eradication of this weed. However, because of the wide variation in soil and growing conditions it always is wise to seek recommendations from local workers who have had experience in treating this weed, as oftentimes a method which is used in one district or State may prove somewhat less effective in other areas.

In Idaho where large acreages of White Top have been controlled and eradicated, three

methods are used with satisfactory results. Cultivation or clean tillage is the oldest known method of eradicating weeds, yet it still plays a most vital part in any well-organized program. Effective chemical methods of weed control still are very limited, and because of the large cash cost, are recommended as practical only for small areas. Large areas infested with White Top can be placed under control and eradicated by continuous cultivation. Such a program requires the land to be taken out of production for at least 2 years and usually cropping to a check-row crop the third year in order that an occasional remaining plant might readily be treated and eradicated. Under Idaho conditions the duckfoot weeder has proven to be the best tool. At present, recommendations call for working the infested areas often enough to prevent any growth from emerging through the surface soil. This in most soils usually means an average of every 7 days the first year and somewhat less often the second year, due to weakening of the plants.

Tillage operations should start early in the spring by plowing as deeply as possible and then following with the regular cultivations. A second plowing in late July often has proved profitable. Experimental work now under way indicates that longer periods of time between cultivations may be as effective, yet as cultivation simply is a process of starving the plant to death by gradually using up the stored food in the roots and preventing further manufacture of plant food by keeping all top growth removed, the safest criterion is to cultivate often enough to prevent any growth.

Many chemicals have been used in Idaho experimentally, yet only two have proven sufficiently satisfactory for general recommendations. These chemicals, carbon bisulphide and sodium chlorate, are widely used with satisfactory results. *No chemical yet discovered, however, is 100 percent effective under all conditions,* and thorough trials on a small scale should be carried out before heavy investments are made.

Carbon bisulphide is very effective on White Top when used in areas where soil moisture can be controlled. Its use in Idaho is restricted primarily to the irrigated lands. While this material is far more expensive than chlorates, its effectiveness, together with the fact that little or no soil sterility results from its use, makes it desirable, especially for high-priced, productive soils. Complete details on methods of application can be obtained in bulletin form.

Chlorates, in various forms, are

widely used as herbicides. In Idaho they have a definite place in the weed program and give satisfactory, although not always uniform, results. Chlorates especially are adapted to use on ditchbanks, roadsides, and other waste areas as under these conditions soil sterilization often is advantageous. The rates of application vary so widely with chlorates that local tests should be made to determine the proper rates of application before being extensively used.

Various arsenicals and other commercially advertised herbicides have not, to date, proven practical under Idaho conditions for the eradication of White Top.

White Top, with its already wide distribution throughout the Western States, threatens the wholesale destruction of large areas of valuable agricultural land. Every farmer should become acquainted with this pest so as to be able to identify it readily, should it appear on his farm. Small areas are easy to eradicate without heavy cost, while if given a chance to establish itself the weed soon spreads and the cost multiplies rapidly. Organized effort is the only means of successful weed programs, and deserves the co-operation of every progressive farmer.

White Top, while only one of a long list of serious weed pests, is a striking example of the damage that pernicious weeds can cause if allowed to go unattended.

Out of the Funny Page, Onto the Farm

Condensed from Nation's Business

Julietta K. Arthur

WHEN the Sultan of Turkey gave his friend, the American Ambassador, a few prize Angora goats exactly 90 years ago, it is hardly likely that he foresaw the raising of goats as a major industry in this country. Yet, from that negligible beginning, has grown a national business which, in 1938, produced nearly 17,000,000 pounds of mohair clipped from the descendants of those famous Turkish goats.

Because of the demand for mohair fabric for automobile upholstery, the state of Texas alone produced in a single year approximately 14,000,000 pounds of this material.

But it is the Angora's European cousin, the milch goat, which has crowded to the foreground in the

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past few years. Commercial production of goat milk is one of the world's oldest agricultural industries but, until 25 years ago, it was all but unknown in America. In the past ten years it has taken a spurt, particularly attracting the attention of the small investor, and the farmer with either limited space or limited funds.

Ray Shaw, postgraduate student at Downey Union High School, in California, needed money to see himself through school. Eighteen months ago he bought three milch goats after conferring with several doctors who were willing to recommend the milk to their patients because of its special properties. Now he has 33 goats, fine barns, a modern milk house with cooling system, yards and runs.

One of the three goat dairies now offering milk to New York City residents was started as a hobby by Freeman Prasse, truck farmer of Staten Island. His dairy, comprising 15 Nubian milch goats, has been certified by the New York County Medical Milk Commission. Assisted only by his mother, Mr. Prasse now markets his milk—at 30 cents a pint—through dairy distributors. In a space hardly larger than a good-sized city lot, he is demonstrating what can be done in goat-raising on the outskirts of a big city.

Mrs. Carl Sandburg, wife of the American poet, has one of the finest goat farms in the country, at Harbert, Mich. Her prize goats are shown at fairs throughout the United States and she collaborated with the University of Missouri in research designed to raise standards among goat-breeders.

Here are three typical examples of what is happening all over America today. In some sections, goats are helping to cut the cost of living by replacing cows on small farms and suburban lots because they are cheaper to maintain. Even if goats were not less expensive to handle, their milk would still be in demand. Many physicians claim that goat milk possesses special nutritional values, particularly for infants and persons suffering from digestive disorders, where cow's milk cannot be used with success.

Enthusiasts claim that the raising of blue-blooded goats is one of the fastest growing businesses in the country, enrolling thousands in "capriculture," and supporting three national organizations (the latest formed in 1935) and three magazines wholly devoted to goat news.

Although the industry is still small as compared with the great cow-dairy industry, commercial production of goat milk is no longer an experiment. According to Prof. J. C. Marquardt, of the

New York State Agricultural Experiment Station, about 5,000,000 quarts of goats' milk are being consumed daily in the United States, representing about 5,000,000 milch goats, exclusive of bucks and kids. It is estimated that the annual retail value of goats' milk is more than $250,000,000, and growing yearly.

The interest in this re-born old industry can be gauged by the fact that the New York Breeders' Association, which in 1934 started with 100 members, now has five affiliated associations, with about 700 members. And at a meeting of the Certified Milk Producers Association, of America, recently, a member of the Kings County Medical Commission reported that the use of goat milk in New York City had grown from virtually zero three years ago to about 1,500 pints a day.

If when you think "goat" you are reminded of that favorite stand-by of jokesmiths—the tin-can eating, alley variety, malodorous, bad-tempered and dirty—then you've never heard of the aristocrats of the industry, such as those on A. F. A. Konig's Milkdale Farm, at Newtown, Conn. In 1937, 800 visitors from 23 states viewed his model goat dairy. Barns are immaculate, animals are given blood tests for disease, milk is checked regularly for sediment and bacteria, workers get medical weekly examinations, all utensils are sterlized, and each goat's udder is washed with germicide before every milking.

Miles away from the cartoonists' "common," ugly, long-horned creature, are the four chief milk-producing breeds, the Nubian, Alpine, Saanen, and Toggenburg, all importations. There is no best breed of dairy goats. Well-bred individuals of each of the four leading breeds will produce considerable quantities of milk, although the highest official test on record in the United States was made by a Saanen doe that produced 4,161.7 pounds of milk in nine months and ten days, an average of 6.9 quarts a day.

Experiments now under way are expected to lead to the development of a goat that will be both a wool and milk producer. So far the Angora has proven almost worthless as a milker, while the milch breeds have not been good wool-bearers.

The "common" or American variety will rarely be found in dairies. However, both the Government Bureau of Animal Husbandry and the New Mexico Agricultural Experiment Station have experimented with grading up common does with pure-bred bucks of milk breeds, and at the New Mexico Station the milk production increased in one instance from 522 pounds for a native doe to 1,060 pounds for a de-

scendant of a native doe that had a pure-bred Toggenburg sire.

Good grade does can be bought from $35 to $75; pure-bred does sell from $100 to $300, and pure-bred doe kids from $50 to $100, buck kids from $35 to $75. The Department of Agriculture reports that feed costs at its experimental station at Beltsville, Md., were between $10 and $15 a year, but the average for the private dairy is more likely to be ten cents a day. Some goats produce as little as a quart a day, the average is two. Good milkers can produce three quarts—prize winners considerably more.

Prices vary, depending on the local market and the demand, which at present, unlike the sale of cows' milk, is largely a matter of development by the individual goat-dairy man. The poorest quality of milk sells occasionally as low as 15 cents a quart, while the best brings as high as 60 cents—the current retail rate in New York City.

Goat-breeders have one advantage over the cow dairy-men in that usually goats are born in pairs. Triplets are rare, and quadruplets something to land the lucky goat owner in the local newspaper.

The first question any newcomer to the industry asks is "What will be my profits?"

Mearle Rhinesmith, owner of the Yokelawn Goat Dairy, at Wanaque, N. J., says, "The profit from a well-managed, well-bred dairy goat is probably greater than from any other animal." Mr. Rhinesmith ought to know. He owns Chrystal Helen, world record Toggenburg. She produced $953 worth of milk by the time she was three years and seven months old.

However, Mr. Rhinesmith, in common with all goat-breeders, views with alarm the sudden rush of amateurs who think all that is needed to earn a quick fortune are a few $5 goats, a brush patch, a tumble-down shed, and a handful of oats a day.

The average beginner buys any kind of stock which has been well-advertised, puts up a building, gets a government leaflet—and thinks he is ready to begin. What is needed, according to the successful goat-dairy people, is a certain amount of capital, the best equipment, general business ability and experience, and a certain amount of "goat sense."

For the encouragement of the beginner it should be pointed out that some of the most successful goat-dairies were started on the proverbial shoestring, and a good many, like that of Juan Ceballo, a Wall Street broker, originally started merely as hobbies, or, at best, side-lines.

However, to command a high price, the milk must be produced under the most rigid sanitary re-

quirements. Too many people keep an insufficient number of goats to make a dairy fully profitable, the leaders in the industry say. Whether you raise one goat or 100, a modern sanitary barn and a milk house must be provided. Marketing, delivery, and advertising charges must naturally be deducted from the profits. Barns need not be elaborate, and like those of Freeman Prasse, on Staten Island, can be home-made, but they must be designed to reduce the amount of labor needed, and to permit scrupulous cleanliness. A steam sterilizer for bottles and utensils is necessary, as well as a milk cooler, an aerator, and a small refrigerator for storage.

One prime advantage the goat-keeper has is that goats, unlike cows, are rarely susceptible to those two dreads of the dairyman, tuberculosis and Bang's disease. However, they are sometimes susceptible to pneumonia, and must be kept in a dry place, out of drafts. Although a cow produces more milk than eight goats, six or seven goats can be kept at the same cost and trouble as one cow. In a year the goat produces 15 times her own weight in milk, and gives in proportion to her weight twice as much milk as the cow.

One of the industry's biggest tasks has been combatting the curious legends which have grown up around goat's milk. A good many persons still think of it as an odorous, bad-tasting fluid. Actually the milk has about the same taste as cow's milk, although goat's milk is whiter and, because of its fat composition, rarely raises cream in the bottle.

Furthermore, far from being filthy, the goat is much more finicky about her food than a cow.

Another serious problem is that goats can only rarely be bred in the spring and summer. This makes it difficult to obtain a uniform year-around milk supply. The Missouri Agricultural Experiment Station has already begun the study of the problem.

A Sale For More Products

Although the main output—and the money—lies in goat's milk at present, butter, ice-cream, and cheese are also marketed.

Cheese has been termed by some as "the brighest spot in the goat industry." Millions of pounds of goat cheese are now imported annually and wholesalers are said to be eager to handle domestic cheeses when they are available in adequate quantities. One of the largest manufacturers of goat-milk cheese has repeatedly stated he has but two difficulties: getting enough milk, and, as he puts it, "trying to keep the business from running away from me." He can and does sell all the cheese he can produce.

By-products of the industry include manure, particularly in demand by florists, and goat's hair, which when shorn in the spring is used for horse-collar stuffing and mattresses. Milk dairymen hope, too, that eventually this country, as Europe does now, will eat goat meat as readily as lamb, which the kid sucklings resemble in delicacy and tenderness. There is already an active market for them in some regions.

Says Professor Marquardt:

Each year we import from 60,000,000 to 100,000,000 pounds of goat skins from India, China, Brazil, Spain, Argentine. Even Sweden, Canada, and France enjoy our market. In this country the question has hardly been touched. It would be worth while for the various goat associations to know more about the goat hide and hair industry in our country.

Because of our vast importations, it can be supposed that there would be a ready market for all skins that could be produced, since they are widely used in the manufacture of shoes, gloves, book-bindings, pocketbooks, and similar articles. As a rule the skins are worth from 25 cents to 50 cents each.

In Europe the goat is often spoken of as the "poor man's cow." In the United States the milk-goat industry is only in its infancy. It has every promise of becoming more important as people become better acquainted with its possibilities. Although the goat in the past 35 years has been found to be well adapted to our country, it takes time to educate men and women to the value of any new industry. For those in the vanguard, goat-keeping offers modest but fairly certain profits, the joys of pioneering—and little competition in an industry where the ultimate results seem to justify the hard work and long hours which are inevitable parts of this seven-day business.

The European Corn Borer

Condensed from Farm Research

G. E. R. Hervey and L. A. Carruth

APPROXIMATELY twenty years have elapsed since the European corn borer was first discovered in New York State. During this period it has spread from the original centers of infestation to all parts of the State where corn is grown. The first infestations consisted of a strain of the pest having one generation a year. Serious injury from this one-brooded form has sometimes occurred in localized areas, especially near the Great Lakes, altho in general the insect has not assumed the importance in New York that was anticipated at the time of its introduction.

At approximately the same time that the first outbreaks were discovered in New York another outbreak was found in eastern Massachusetts, which consisted of a strain of the borer having two generations a year. In the intervening years these two strains have maintained their identity. The single-brooded form has spread westward along the Great Lakes thru Pennsylvania, Ohio, Michigan, Indiana, eastern Wisconsin, and in Ontario, Canada. The two-brooded strain has spread thru New England and along the Atlantic seaboard from Maine to Virginia.

The two-brooded form has proved consistently more injurious than the single-brooded strain and, in addition, attacks a larger number of hosts, including many cultivated plants and common weeds. The single-brooded strain attacks corn chiefly but is occasionally found in large-stemmed weeds either in or at the margin of corn fields.

Assuming that the insect continues to spread westward, and there is reason to believe that it will, there is the distinct possibility that it may soon create a serious situation for growers of market and canning sweet corn.

In the area of severe infestation in eastern New York during the season of 1938 much of the early sweet corn harvested in July was practically worthless because of borer injury. Many of the fields were from 80 to 100 per cent infested and 10 or more borers were frequently found per plant. Medium early corn was relatively free from injury, while late corn, or that harvested after the first of September, was about as seriously infested as the early corn.

There is at present no satisfactory commercial control measure for the European corn borer. This

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is true particularly of the two-brooded strain. There are several lines of investigation being carried on by State and Federal agencies which show some promise as control measures for the insect, including the introduction of parasites, the breeding of resistant varieties of corn, and the development of insecticides.

During the season of 1938 some work with the use of insecticides was carried out in the Albany district by this Station and rather promising results were obtained. Powdered derris root, containing 5 per cent rotenone, used at the rate of 4 pounds to 100 gallons of water with a suitable spreader, gave very good control of the insect. Four to five treatments were necessary to protect the rapidly growing corn plants during the egg-laying season. The treatments were distributed over a period beginning when the first eggs started to hatch and extending until shortly after egg laying reached a peak. Certain fixed nicotine dusts and sprays also reduced borer population but were less efficient than the derris spray.

The development of insecticidal control is hampered by the difficulty of reaching the newly hatched borers which feed between the leaves in the crown of the plant. This difficulty is overcome thru the use of one of the newer wetting or spreading agents. Such materials reduce the surface tension and cause the mixture to penetrate the spaces where the insects are feeding. The use of insecticides would involve additional expense and labor, but it is possible that this method of control might prove feasible for early sweet corn grown for the market. Many details will still have to be worked out before the method can be suggested for use in a practical way.

In studying the effect of planting dates on the rate of infestation, it was noted that corn planted during certain periods sustained relatively little injury. During 1938 this period for the Capitol District occurred with crops planted approximately between May 10 and June 5 and harvested during August. On Long Island, in Nassau County, this same situation was noted on corn planted to mature during the first half of August. The practice of planting sweet corn during the proper period to avoid injury from borers at harvest is probably of limited commercial value since most growers prefer to have a succession of plantings maturing at short intervals thruout the season.

Clean up practices, which include the disposal of corn remnants by plowing or burning, have probably received more attention than any other phase of

corn borer control. While it has been repeatedly demonstrated in experimental tests that these practices will destroy most of the borers, there are practical difficulties to be overcome in the general use of this procedure. The ability of corn borer moths to fly for considerable distances makes it necessary for clean up practices to be carried out on a community basis. Furthermore, in areas where the two-brooded strain exists there is also the problem of disposing of many host plants in addition to corn.

Any satisfactory method for controlling the European corn borer in sweet corn must be cheap because of the small per acre profit obtained from the crop. It is the goal of the Experiment Station to develop such a method.

Paint

Condensed from Successful Farming

Walter J. Hunt

OF all the reasons that you may advance for painting your home, a sifting will just about simmer them down to two: to protect surfaces against weather, warping, cracking, and rusting (in other words, to keep your investment as nearly as possible as it was when you made it); and to provide an attractive dress which will remain reasonably clean. To most of us these are reasons enough, as witnessed by the estimate that, before the close of 1939, painters, both amateur and professional, in the United States will have spread over wood and metal surfaces pigments and oils amounting to some 100,000,000 gallons!

Once you make the decision to paint, the questions of *how* and *what* to apply arise, and you will do well to give certain guide posts at least a passing glance.

One cardinal principle that stands out for the buyer and user of paint is to do business with a reliable dealer whom you know and can trust to advise you, and who offers a product from an honest manufacturer.

For more than 30 years, North Dakota's state chemist has warred on adulterated, misbranded, and otherwise dishonest paints. This state was the first firmly to thwack such goods when, some three decades ago, a law was enacted requiring that all paint in

Reprinted by permission from Successful Farming, Des Moines, Iowa, July, 1939

intrastate commerce be labeled on each container with an exact accounting of what it contained. Since then some other states have passed similar laws. Recently the National Paint, Varnish & Lacquer Association, Incorporated, has prepared a uniform labeling plan for the use of all its members.

Some low-grade paints contain as high as 25 percent water. At times it masquerades on the label as "aqua," "emulsion," or "colloidal solution," but it's water just the same. Water can serve little useful purpose in paints—except, of course, the cold-water paints or whitewashes. There scarcely is valid reason for more than one percent of it in the liquid content, and many good brands contain none.

There are certain less-expensive materials, sometimes referred to as "inerts" but properly classed as transparent pigments. They include magnesium silicate, talc, barytes, silicas, whiting, chalk or calcium carbonate, calcium sulphate, china clay, and mica. Formula labels sometimes ambiguously call mixtures of these "silicates," "inert pigments," or "extending pigments." In prepared paint they legitimately are used to improve brushing consistency and keep pigments from settling to the bottom of the can. In the interest of economy, transparent pigments may be used as generously as consistent with durability and hiding qualities of the paint. Excessive amounts of them are viewed with suspicion. Varnish or resins in outside paints have an odious reputation because very cheap and unreliable paints often contain varnish and a large volume of mineral spirits and water. Varnishes are not for that purpose.

The presence of volatile thinner in paints is to be watched, es-especially if there is too much bodied oil. To quote from the February *Consumer's Guide*: "When the volatile thinner amounts to more than 15 percent of the liquid part of the paint by weight, consumers are receiving a clear signal to watch out. Conversely, no less than 85 percent of the liquid part of the paint by weight should be drying oil . . ." (linseed or a mixture of linseed, tung, soybean, or perilla oil).

Paint-makers use petroleum products, mineral spirits, varnish, and naphthas for various thinners "volatile thinners"—because they dry so rapidly. The safest thinner for the home painter is, of course, good turpentine.

Opaque (not transparent) white pigments commonly used in house and barn paints are basic carbonate white lead, basic sulphate white lead, zinc oxide, the titanium pigments, the zinc sulphide pigments, including the lithopones. Red barn paints use

iron oxide as their base, and in barn paint this material should comprise not less than 30 percent of the total pigment by weight.

High-grade white and tinted house paints fall into three broad groups. Their liquid consists of linseed or other drying oil and moderate proportions of volatile thinner. Pure white-lead paint, sold chiefly in the form of a soft paste paint to be thinned and tinted by the painter, is a standard article of long standing and a simple product to buy and use consistently. The other two paint types, respectively, contain principally lead and zinc pigments and titanium, and lead and zinc. They are best obtained in prepared form. Manufacturers make numerous types of these for different purposes and effects in the painting job. Most paint labels tell what the paints are made for.

Before determining the kind and color of paint to use, the program that has been followed in the past needs consideration. On this point, F. L. Browne, senior chemist at the U. S. Forest Products Laboratory, in Wisconsin, has done a great deal of research. If one is starting on a surface that has received no previous painting, the problem is less complex. As the greatest factor in the cost is labor, one is hardly justified, in view of the risk, in using the cheaper paints. Ladd has concluded that on the whole, the cheaper paints, while they are priced lower per unit, over a period of years will wear only about a fourth as long but will cost almost *three times as much* as those of accepted quality.

Good house paint usually will weigh 16 to 18 pounds per gallon and good barn paint comes at about 12 pounds per gallon. Browne cautions that before repainting is done, the kind of paint used when the previous coat was applied be ascertained.

Certain repainting combinations that have repeatedly caused abnormal and usually unsatisfactory developments are white paints over yellow ocher primer or paint; white paints over colored ones such as red, brown, green, or black; house paints over varnish or enamelized surfaces; and pure white-lead paint over those of mixed pigments that have not aged for a very long time. Mixed pigments can, however, be put over white-lead paint. Excessive moisture in or back of the wood may cause early blistering or other evidences of improper paint failure. Remember that painting should be done in good weather in temperatures from 60 to 80 degrees Fahrenheit.

As a general rule, it is safe to consider that each repainting job should be, in so far as possible, done with the same *kind* of paint as was applied before.

Usually it is considered that

pure white-lead paint is well suited where there are likely to be relatively long periods between paintings. It is not complicated. It wears thin by chalking and crumbling and may after long neglect still look reasonably well and be repainted easily. It is known as a soft paint. The lead and zinc and the titanium, lead and zinc, paints are harder and have numerous advantages under certain circumstances, especially where painting is done at shorter intervals. They make harder surfaces, hold tints to better advantage, have superior hiding power; and the titanium group in particular cleans up earlier. Repainting with any materials at intervals of less than three years is rarely advisable.

Aluminum paints, made with aluminum powder and a special vehicle or liquid, in recent years have been found very good for priming coats on new wood. Durability of succeeding coats of regular house paint seems to be enhanced. This has been consistently true in nearly 200 tests at the Forest Products Laboratory. The advantages were of special significance on Douglas Fir and Southern Pine having wide bands of summerwood. For painting metal and galvanized sheets there are some special paints which can be recommended.

The so-called "exterior enamels" find their proper use on blinds, casings, doors, sashes, and so on, as do the "deck" paints on porches and floors where both the friction of traffic and the effects of the weather must be considered.

Plaster and wall-board surfaces call for the wall paints, running from glossy to flat. Or, if a less expensive paint is desired, casein paints and calcimine fill the bill.

If your painting job appears more than ordinarily perplexing, any good manufacturer will be glad to give you advice and direction. The Forest Products Laboratory has publications which give detailed directions along with instructions for handling different paints and surfaces. There are other sources of good information such as the "Painting Specifications" of the Painting and Decorating Contractors of America; the listing of painting literature in the *Consumer's Bookshelf* (15 cents, Superintendent of Documents, Washington, D. C.); and many more.

George Washington — The Horseman

Condensed from The Horse

Charles B. Roth

ALTHOUGH historians in telling the story of the great first president, refer to his idyllic existence at Mount Vernon and his great love for animals, they are too busy extolling him as a statesman and a general, to devote much time to Washington the horseman. But the fact about George Washington is that he was the first horseman of his day, enjoyed himself more when riding than when doing anything else, introduced the breeding of mules into the United States and took a firm stand for better horse flesh of all kinds.

He had over fifty draft horses at Mount Vernon, all cared for as befitted the animals of a man who loved horses, and his glittering carriage was drawn by six of the sleekest shiniest horses in the land; but it was his saddle horses that George Washington loved the most.

And of the saddle horses none ever came up to *Nelson,* the president's favorite saddle horse for years and years; *Nelson,* the gallant saddle animal that helped make the history of the United States.

Nelson was a light chestnut with white face and legs and was tall for that day of short horses, for he stood sixteen hands and was sturdy and strong. He was named after Washington's good friend, Thomas Nelson, of Virginia, governor of the state.

Whenever George Washington wanted a horse to ride for pleasure or hard work, he always saddled *Nelson,* and one May morning in 1775 he rode the horse into Philadelphia to attend the Second Continental Congress. The ride of Paul Revere is much more widely publicized, but that ride which George Washington made on *Nelson* is perhaps more significant, because the Congress named Washington the commander-in-chief of all the Continental forces. And the War of the Revolution began in earnest when he assumed full command. One can almost say that his horseback ride on *Nelson* was one of the most significant rides in the history of the world!

All through the war, the commander rode his tall chestnut. *Nelson* never faltered. He never refused. He carried his master into the thick of the fight, and where other horses might become nervous or frightful under fire, *Nelson* responded as coolly to the

Reprinted by permission from The Horse, Washington, D. C.

commands as he did on the bridle paths of Virginia.

But *Nelson* was mortal and needed rest and on occasion General Washington was forced to ride other horses. At the battle of Monmouth, for example, *Nelson* was retired for a day's rest after several hard days in the field. His master rode a handsome white charger, but when the white horse gave way and fell, Washington ordered that *Nelson* be saddled. All night he carried his large master.

The General wasn't very well pleased at the prospect of anyone else riding his favorite horse, and always refused permission, except once.

A courier named Gray was sent for, asked if he would ride post haste to Philadelphia with a letter to Washington's good friend Robert Morris, who might be induced in a crisis to provide money for the purpose of carrying on.

Gray agreed to go.

"What is the quickest time you can ride to Philadelphia?" asked the General.

Gray told him.

"Then take the best horse in the army and set out immediately," he was ordered.

"But sir, the best horse in the army is your chestnut." said the courier.

"Take him and go," said the General.

And the courier did. He rode *Nelson* into Philadelphia, arriving there several hours sooner than he had expected, and Robert Morris listened to the plea and acceded to Washington's request.

There came an afternoon in October when General Washington rode *Nelson* triumphantly into Yorktown, a signal that the war was won. After that *Nelson* was never ridden again. He lived out the rest of his days at Mount Vernon, a pensioner who had loving care, who was stabled in winter and carefully groomed. One traveler reports seeing him at twenty-two and says he looked in the sleek condition of a colt.

And every day when he was home George Washington must visit the paddock or the pasture to see and pat the head of his gallant old army horse *Nelson.*

During these years *Nelson* shared the affection of his master with another favorite horse—*Blueskin.* This dark iron grey horse was Washington's hunter, and he might have had as honorable a war record as *Nelson* if he hadn't been so nervous under fire.

Fox hunting was George Washington's favorite sport and *Blueskin* his favorite hunter. You can read descriptions of George Washington, the fox hunter. Tall and heavy, straight and well-formed, he dressed in a blue coat with a scarlet waistcoat, buckskin

breeches, topboots and velvet cap. Mounted on *Blueskin,* in hot pursuit of the imported foxes he had turned loose on his estates, following his large pack of hounds, he must have made a picture which would delight anyone who loves horses and hunting.

Naturally, Washington had other horses besides these two; many horses, for he was one of the leading breeders of his day and, incidentally, he was a good hand at a horse trade.

Once "Lighthorse" Harry Lee, bringing a team of very fine horses into Mount Vernon, remarked that they were George Washington's kind of horses but that George Washington would never own them. Asked why, responded: "Because the General never pays more than half what a good horse is worth." Which indicates that the father of his country had a shrewd eye to the value of horse flesh.

One of his secondary favorites was a horse named *Greenway,* a dark gray, fast and enduring. Washington used him a great deal in fox hunting, but *Blueskin* was always his favorite. *Greenway* had been the favorite horse of the British General Braddock, who presented it to Washington after Monongahela. Other horses Washington loved included *Leonidas, Sampson, Steady, Traveler* and the pure Arabian *Magnolia.*

He isn't generally credited with responsibility for the development of the mule in the United States, but the fact is that George Washington conducted the first breeding experiments of mules in this country.

His friend the King of Spain, learning of George Washington's interest in animal husbandry and his desire to produce a work animal that would be able to stand the rigors of pioneering in a new land better than the orthodox draft animals then in use, made him a present of two mules, a jack and a jennet. The jack was named *Royal Gift* and became famous as the sire of some of the finest mules. The Marquis de Lafayette sent his American friend some jacks from France, and these two were used in developing the American mule.

Washington was emphatic and articulate in his opinion about the benefits of agriculture and animal husbandry, for he wrote to a friend that agriculture was the noblest, the healthiest and the most worthy occupation of mankind. And he might have added that in his opinion horsemanship was the most delightful. That is what he believed.

He was the first horseman as well as the first citizen of early America.

How New Citrus Varieties Are Developed

Condensed from Texas Farming and Citriculture

John F. Wood

Horticulturist, Texas Experiment Station, Hidalgo County

CITRUS varieties grown for their edible fruit may be divided into four main groups: grapefruit; sweet oranges; the acid citrus fruits, including lemons and limes; and the Mandarin group, including tangerine oranges and the Satsuma orange. Other important types used for rootstock are the sour orange, the rough lemon, and the trifoliage orange.

The first citrus plantings in Florida and California were of seedling origin. There was considerable lack of uniformity in the fruits from such seedling groves. To overcome this difficulty, attention was soon turned to selecting superior strains or varieties and propagating them vegetatively. Budding became the standard method of propagation and is now used almost exclusively. By the use of vegetative propagation, the perpetuation of a strain of citrus originating from a single tree became possible; hence in a few years a large number of varieties became established.

There are three methods of approach in the improvement of citrus varieties; namely, bud selection, either from bud sports or from superior strains of a variety; selection from open-pollinated seedlings, and selection from controlled hand-pollinated seedlings.

Bud selection has proved to be quite valuable in the maintenance of citrus varieties. It has been proved that superior strains may be perpetuated by careful selection of the buds from a citrus orchard. Buds taken from trees of high productive capacity, with fruit of excellent type are more likely to transmit such qualities than buds taken from inferior weak trees. Citrus, under certain climatic conditions, is subject to a high mutation rate. This simply means that bud and limb sports, which bear fruit different from the parent tree, are frequently encountered. Some of these differences are readily apparent, such as an outside blush on fruit from a bud-sport on a tree that otherwise produces fruit without such a blush. Such differences may be inferior or superior to the parent strain, and there may be differences in size, shape, quality, maturity and other characteristics.

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If a tree or a portion of the tree is found which bears fruit that is outstanding from any standpoint, it should be adequately marked and buds should be taken from it for propagation. Not all differences are due to inherited qualities and this should be determined before any extensive plantings are made. If budded trees from a sport tree or limb in turn reproduce the same type of fruit as the parent limb, then and only then, should it be publicized and offered for sale.

Selection from open pollinated seedlings was the first method of citrus improvement tried. This method means growing seedlings from a known strain or variety and making selections from these seedlings of superior sorts. The larger proportion of our present day varieties originated in this manner. Since all of the early plantings were of seedling origin, there were thousands of such trees from which to choose.

Citrus trees do not come true from seed, hence the possibility of improvement by this method. The fact that the individual flowers are visited by insects and thus contaminated with foreign pollen, accounts in part for the lack of uniformity of seedling trees. Citrus seed exhibit a condition known as polyembryony, wherein more than one seedling is produced from a single seed. Only one seedling from a seed will be the direct result of sexual fertilization, but there may be several seedlings produced from the same seed by stimulation. Such seedlings are called apogamic seedlings and carry only those heritable traits transmitted by the maternal parent, or mother plant, since no male pollen entered into their formation. These seedlings also give rise to new sorts of citrus and tend to make citrus breeding rather complicated.

During the period from 1900 to 1910, the United States Department of Agriculture started a rather extensive program of improvement of citrus varieties by breeding. This early work was done mostly in Florida. In subsequent years, the experiment stations in Florida, California, Texas, and Arizona, in addition to the United States Department of Agriculture, have become engaged in a far reaching program of citrus fruit breeding. Relatively few individual citrus growers have concerned themselves with this method of improvement because of the time and expense envolved for the benefit obtained. However, this does not mean that growers should ignore this important means of obtaining new and better varieties of citrus.

In order to be able to cross citrus fruits properly, it is essential to know the structure of the flowers and the nature of their pollination. The citrus flower is

usually composed of five white, showy petals surrounded at the base with a small three or four pointed part known as the calyx. Inside of the petals are twenty stamens arranged in a circle around the center of the flower. Each of these stamens contains an anther at its uppermost tip. The anthers are filled with thousands of microscopic pollen grains which contain the factors for male inheritance. Only one of these pollen grains is necessary to produce a seed in the fruit. The pistil or female part of the flower is found in its center and consists of the stigma, the style and the ovary. The stigma is the upper tip upon which pollen grains fall and germinate. The style is the connecting tube between the stigma and the ovary, which is at the base of the flower. Inside the ovary are a number of ovules or egg cells which contain the factors for female inheritance and which when fertilized, become the seed. Pollen grains fall on the stigma, germinate and send tubes down through the styles into the ovaries. The contents of the pollen grains are spilled into the ovules, thus causing fertilization of the male and female components of the flower. A grapefruit or orange, therefore, is an enlarged ovary, the rind being the outer ovary wall, the flesh being the inner ovary tissue, and the seed being the fertilized ovules. The small hard portion attached to the stem-end known as the "button" is what remains of the calyx which originally surrounded the petals of the flower.

In order to effect controlled hand pollination, the operator must be assured that only the pollen desired ever comes in contact with the female part of the flower. In order to accomplish this, it is necessary to remove the male part of the flower before the pollen grains are ripe. This is done with a pair of tweezers, care being taken not to injure the female part. Then, in order to avoid contamination with foreign pollen, flowers thus treated are enclosed in paper bags for a few days until the stigma becomes ripe. This will be made apparent by the formation of a white sticky mass on its surface. The desired pollen, taken from flowers previously bagged to avoid contamination, is placed on the ripe stigma and the flower again enclosed in the paper bag for a few days. At the end of this time, the stigma and style, having served their functions, will be withered, leaving the ovary with its fertilized ovules or seed. A bag is no longer necessary, since contamination is now impossible. The twig containing the small fruit is marked carefully, and when the fruit ripens, the seed are extracted and planted. Several years will be required to bring the seedlings

into bearing. At the end of that time, it may be found that although new sorts have been created, none are superior to existing varieties. But on the other hand, an outstanding fruit may be produced which may revolutionize the citrus industry.

The citrus breeder has at his command a large number of species, different in size, shape, color, flavor, quality and in other respects. So far, the most successful crosses have been those between the tangerine and grapefruit known as the tangelos. The work at the Valley Experiment Station has been in progress for several years. Seedlings of the following citrus hybrids are growing on the station at the present time: Orange + lemon, tangelo + tangerine, tangelo + pink grapefruit, tangelo + orange, and orange + pink grapefruit. None of the seedlings are sufficiently old to bear fruit at this time. It is possible to set definite objectives in citrus breeding and carry them to rather successful completion.

Crosses involving oranges and lemons may result in high quality orange of ample acidity. Hardiness to cold is desirable in all citrus varieties. This is especially needed in the limes and lemons. Crosses involving the Meyer lemon, which exhibits cold hardiness, with limes and other lemons, should result in more hardy varieties. Increase in size of oranges and earliness in Marsh grapefruit are both needed in this section, and it may be possible to bring these things about by breeding and selection. The possibilities of citrus improvement by breeding are enormous, and the field is practically in its infancy. Within a relatively few years, we may expect to have several superior citrus varieties as a direct result of controlled pollenation that in all probability would never have occurred in nature.

Fertilizing the Wheat Crop

Condensed from The Ohio Farmer

C. G. Williams

TWENTY-FIVE years ago a fertilizer experiment was started at the Ohio Experiment Station to determine in what proportions nitrogen, phosphoric acid and potash could be used most profitably. It was built around the popular fertilizer analyses then in vogue.

These different analyses were used at the rate of 1000 pounds per acre, per four-year rotation consisting of corn, oats, wheat and clover. No manure was used in this particular experiment.

Among other analyses an 0-16-0 was compared with an 0-12-4. Every crop in the rotation gave larger yields with the 0-12-4. While the increased cost of the latter over the 0-16-0 was only 16 percent, the balance remaining after paying for the fertilizers was 100 percent greater, as an average of the last nine years. Clearly some potash was needed.

What about a little nitrogen? In a further comparison the percentages of both phosphoric acid and potash were reduced and a little nitrogen was substituted in a 2-8-2 fertilizer. This resulted in a reduction in yield of all of the crops except wheat. Evidently the wheat crop called for a little nitrogen. While the cost of the 2-8-2 was a little less than the cost of the 0-12-4, so also was the balance after paying for the fertilizer.

Going back to the 12 percent of phosphoric acid as found in a 2-12-2 analysis, the yields of all the crops of the rotation were decidedly increased as compared with the 2-8-2, and the balance over costs as well.

What about more potash? A 2-12-4 gave a decided increase in corn yields, but affected the yields of the other crops only slightly.

A 4-12-4 made little change in the yields and reduced the balance slightly.

A further increase in potash in a 4-12-8 fertilizer boosted the corn yields decidedly, and the other crops of the rotation slightly, giving a little the largest balance over the cost of the fertilizer of any of the above-mentioned analyses.

It would seem safe to conclude that under the conditions of this test a so-called complete fertilizer carrying nitrogen, phosphoric acid and potash is required, and that at least two percent of nitrogen is desirable for the wheat

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crop, with some 12 per cent of phosphoric acid and four or more per cent of potash.

The results thus far reported were secured on one type of soil only. Let us take a look at the results on the widely distributed county experiment farms in Ohio. These experiments are for the years 1934–1937. The analyses used in these tests are more in keeping with present tendencies in fertilizer analyses and are based upon the station's earlier work. While the period is short, the results are quite consistent and are worthy of serious consideration.

In these county farm tests the rotation followed was corn, wheat or oats, and mixed hay. Three sets of plots in each county received the following different analyses: 0-20-0, 0-14-6 and 2-12-6. The corn had 150 pounds per acre in the hill, and the wheat, 300 pounds per acre. In addition there was one plot of corn in each county test which received manure and fertilizer.

Now for the results in the fertilization of the wheat crop. The 2-12-6 fertilizer gave the largest yields per acre in the following counties: Belmont, Washington, Meigs, Madison, Clermont, Hamilton, and Miami. Mahoning County gave the largest yield with the 0-20-0 fertilizer.

The plots receiving manure on corn and a 2-12-6 gave larger yields than those receiving commercial fertilizer only, as would be expected. In each of the counties, save one, the 2-12-6 analysis gave slightly larger net returns than either of the other two analyses.

In view of the above results what can be said with reference to the fertilization of the wheat crop in Ohio the coming fall?

It would seem that the Ohio wheat grower is not likely to go far wroug in using a commercial fertilizer analyzing 2-12-6, or one close to this analysis. On land which receives a good dressing of manure during the rotation a 20 percent superphosphate may meet all requirements.

It is perhaps unnecessary to again call attention to a fact that none of our commonly grown farm crops give a more profitable response to commercial fertilizers than wheat, and a few as great.

Just a word as to the amount of fertilizer to use per acre. Seldom is it advisable to use less than 200 pounds, nor more than 400 pounds.

Running Water

Condensed from American Agriculturist

THERE is an old saying that in Colonial times it took three mothers to raise an average farm family. Doubtless one thing that made farm women grow old before their time was close acquaintance with the pump and water pail.

Perhaps it was necesary once, but now an electric motor or gas engine will pump water for 2 or 3c an hour, and who can afford to operate a pump handle for that? It is surprising how much water is used when it is available at the turn of a faucet. Use the following table and see how many gallons a day are needed on your farm:

Needs of	Gallons per day
Each person (kitchen sink only)	8 to 10
Each person (sink, bath, and laundry)	25 to 35
Cow (milking)	15 to 20
Horse	10 to 12
Sheep	1 to 2
100 hens	3 to 4

Certain it is that no other farm improvement offers so much in the way of comfort, health and profit.

Tests show that in the winter cows in a barn equipped with drinking fountains will produce 10 per cent more milk than those that are turned out to drink. Poultrymen will agree that water is the most important part of a hen's diet, and more and more attention is being given irrigation. Seldom or never is there a year when there is not a dry period during which irrigation will increase yields. A severe drought year is just the time when prices for fruit and vegetables are high.

Last, but by no means least, there is the matter of fire protection. Constant close connection with danger tends to breed indifference to it, but fire is a constant menace to farm buildings, and in too many cases there is next to no protection.

Every farm furnishes its own problem when it comes to providing running water. Pressure is essential and, depending on circumstances, can be supplied by gravity, a ram, an electric motor or a gas engine. Records show that the percentage of farms with running water is greater in the hill country than it is on the level. The answer is that springs on hills at elevations higher than the buildings provide a cheap and simple method of supplying water by gravity, usually with a

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storage tank in the attic or the haymow. This system has its limitations, yet thousands of such installations are giving satisfactory service.

When a sufficient supply of water is available, but at a point lower than the buildings, it is sometimes possible to install a ram which uses the power of falling water to deliver about five per cent of the water to a storage tank placed high enough to deliver pressure to the buildings. The installation of a ram has to be studied and laid out by someone who knows rams, and frequently the supply of water is not big enough to deliver a sufficient amount to meet the needs of the farm.

For pumps no power is quite as handy as electricity. Hooked up to a pump and a small pressure tank, the pump is automatic, going to work as soon as the pressure in the tank is lowered and stopping when it is built up to the right point. Gas engines are available that will stop automatically, but they must be started by hand, which is somewhat of a nuisance, particularly if the pump is not in the house. It is also necessary to provide a bigger storage tank so the pump doesn't start and stop so often.

With a shallow well or cistern, the pump and tank are commonly placed in the cellar, but up to recently the problem was complicated where the well was deep and the water had to be raised over 25 feet. Now, however, engineers have developed what are called jet pumps which can be used in deep wells and have all of the advantages of shallow well pumps and none of the disadvantages of deep well pumps. They are easier to install, and although the well may be at some distance from the buildings, it is still possible to have the pump in the cellar.

Necessity has forced farmers to be general handymen, and many water systems have been installed largely or entirely by family labor. The important consideration is to get all available information before you rush ahead in order to avoid costly errors and to get a system that will be most satisfactory for every dollar invested.

In this connection another development is important. Copper pipe is now available in 60 foot coils in practically every diameter. The cost will be from 15 to 25 per cent more than galvanized pipe, but you will make up most of this by saving in installation. The pipe is easily bent, which practically eliminates the necessity for many fittings, and copper pipe of any diameter has less inside frictional resistance and will, therefore, deliver more water than a galvanized pipe of the same size. It is a very simple

matter to install a water system with copper tubing.

Here is a list of bulletins containing information on water systems. The U. S. Department of Agriculture bulletins cost 5 cents each, and can be obtained by writing the Superintendent of Documents, Government Printing Office, Washington, D. C. (send coins). In general the bulletins of state colleges are free so long as they are available to residents within the state. A charge, usually 5 cents, is made where these bulletins are sent outside of the state.

U. S. Dept. of Agr., Washington, D. C.—Farmers' Bulletin 1426 Farm Plumbing; Farmers' Bulletin 1448—Farmstead Water Supply.

N. Y. S. College of Agr., Ithaca, N. Y.—E-392—The Shallow Well Water System; E-145—The Farm Water Supply.

Maine College of Agr., Orono, Maine. — 250-B — Running Water for Farm and Home.

New Hampshire College of Agr., Durham, N. H.—Circular 34—Electric Laundry Equipment on the Farm.

Connecticut College of Agr., Storrs, Conn.—Bulletin 115—Water at the Kitchen Sink; Bulletin 183—How to Build a Septic Tank.

Massachusetts College of Agr., Amherst, Mass.—A-143—Septic Tanks for Farms.

New Jersey College of Agr., New Brunswick, N. J.—E-127 Pollution of Wells and Its Prevention; C-381—A Septic Tank Disposal System.

Electric Water Systems Council, 420 Lexington Ave., New York City.—Your Magic Key to Running Water Profits; Getting Running Water First.

Pump and water system manufacturers will be glad to supply catalogs on request, and in some cases they also have helpful pamphlets on the installation of running water and sewage disposal systems.

Sell Your Feathers

Condensed from Turkey World

M. C. Small
Managing Editor

TURKEY feathers have a great many industrial uses. A few of these uses are for making darts, arrows, fish lures, hats (both men's and women's), purses, artificial flowers, pillows, mattresses, and various articles of clothing.

The increasing interest in archery, badminton and other games requiring the use of feathered darts has increased the use of turkey feathers.

In the past, many of the articles requiring the use of turkey feathers have been imported from foreign countries. Recently, however, a few enterprising business concerns have started to develop new market outlets for turkey feathers.

Although dependable markets are now available for feathers, growers should keep in mind that the profits to be derived from the sale of feathers are comparatively small.

Some preparation and care is necessary to realize greatest returns from feathers.

Feathers from different sections of the body should be kept separately. At the first joint of the wing are the *pointers* which are *one-sided* feathers. These feathers should be kept separately from all other feathers.

The large wing feathers (primaries and secondaries) should be be kept separate from the pointers, body and tail feathers. The large main tail feathers have special uses and must be saved separately.

The fluffy feathers found on each side of the hip are of considerable value, and it is advisable to keep these separate from the other body feathers.

If the bird's tail or wing feathers are badly chewed up or broken, they have no market value and should not be saved. Feathers must be clean and free of blood. They must be dry and free from mold.

Those who dry pick their turkeys will find it quite easy to save feathers for sale. Separate boxes or barrels should be provided for each kind of feathers.

Provide a separate box or barrel for each of the following kinds of feathers: tail, pointer, wing,

Reprinted by permission from the Turkey World, Mt. Morris, Ill.

fluff and body. Remove each and drop them in their respective containers in the order given. The soft fluff feathers are found only on the hips.

Those who semi-scald their birds will find it more difficult to handle feathers properly. In most instances, the birds are stuck and the wing and tail feathers removed before semi-scalding. Since this is true, it will not be difficult to save the pointers, wing and tail feathers before semi-scalding. A few handfuls of the fluff feathers can also be removed with little difficulty before scalding.

White feathers bring much higher prices than colored ones. Bourbon Red feathers also bring better prices than other colored feathers. Since this is true, growers of white breeds and Bourbon Reds should use special care to handle their feathers properly and keep them clean and dry.

When packing feathers for storage or shipment, the tails, wings and pointers should be packed separately in cartons or some similar type of container so that the quills will not be broken. The body feathers can be packed in bags and stored away until ready for shipment. Be sure that the feathers are dry when packed and are kept dry until shipped.

It is not advisable to keep feathers from one season to the next, as they may become moth eaten, moldy, and deteriorate until they are of no value. It is best to sell them while they are still fresh and carrying their "bloom."

Growers interested in investigating the possibilities of selling feathers should write to feather dealers for prices and other information.

Cotton Dusting Machinery

Condensed from Farm and Ranch

H. P. Smith

Chief, Division of Agriculture Engineering, Texas Agricultural Experiment Station, Agricultural and Mechanical College of Texas

THE farmer contemplating the purchase of a cotton duster has about five points in mind on which he wishes information: types of machine, number of acres of cotton each type will handle, whether the machines will handle sulphur, sulphur-calcium arsenate mixtures, and calcium arsenate equally well, whether dusting is better than spraying, and the average cost of a machine.

Types of Machines

Cotton dusters may be divided into two classes according to the manner in which the dust is applied and are termed "nozzle" dusters and "broadcast" dusters. As a rule, entomologists do not recommend the broadcast duster because insect control is not uniform, as dust is applied heavily near the machine and lightly a few rows away. In applying dust with the broadcast type of duster it is necessary to slant the nozzle slightly upward so the air currents can carry the dust over the plants as far as possible and, as a result, most of the dust is applied to the tops of the plants and the bottoms do not receive adequate amounts of dust, especially if they are four or five rows away from the machine. They claim that the dust cannot be directed on the plant where needed and there is not thorough coverage and application of the poison so that best control of insects can be obtained.

The entomologists prefer the nozzle type machine or those machines that have at least one nozzle directing dust to each row dusted. With this type of machine where the nozzle is set so that blasts of air will strike the cotton plants at an angle, the dust is directed down through the foliage and the currents of air turn the leaves so that the poison can adhere to the underside as well as to the topside. The air should come out of the nozzle with enough force to penetrate through the entire plant from the top to the ground. With a nozzle set so that dust-laden blasts of air are directed downward over the plants, all of the terminal

Reprinted by permission from Farm and Ranch, Dallas, Texas, May, 1939

buds which are producing young cotton squares will receive a thorough application of poison. In this way better control of the insects will be obtained. If a good nozzle-type machine is used, each row will get approximately the same amount of poison and, consequently, more uniform distribution can be obtained over all the rows and plants.

In the early years of dusting for cotton insects it was thought that good results from applying dust could be obtained only when the plants were damp with dew. During the past few years it has been found that dust can be applied either day or night with good results, provided the air is calm so that dust can settle among the foliage of the plants. On the average, better results are obtained when dust is applied while the plants are damp as it will stick to the foliage better.

Nozzle machines are divided into several types according to the number of rows dusted and the kind of power used. For small acreages and irregular areas with short rows the hand gun is useful. This is a small duster supported by straps across the shoulder, is cranked by hand, and has a single nozzle for dusting one row of cotton. The best type of hand gun to purchase is one that can be carried comfortably on the abdomen and held firmly against the body so that it is convenient to operate the cranks. This type of gun usually weighs about 20 pounds when the hopper is full of dust. It is very tiresome to operate a hand gun duster for many hours.

A saddle gun is a duster designed to be attached to the pommel of a saddle. It usually has a nozzle extending down on each side of the animal so that two rows of cotton may be dusted at a time. The operator rides a mule and turns the crank, which operates a fan to create a blast of air to blow the dust out through the nozzles onto the cotton.

The one-mule two-row traction-driven duster is sometimes called a "wheelbarrow" duster, because the operator walks behind holding two handles to guide the machine. It is narrow enough to run between two rows of cotton plants and has nozzles extending backward behind the operator so that the dust can be directed onto the plants without very much dust getting on the operator. The feeding mechanism and fan are driven by sprocket and chain from a large wheel which depends upon ground traction to drive the mechanism.

The cart dusters have the hopper, fan, and nozzles mounted on a two-wheel cart and depend on the ground traction of the wheels to drive the fan and feeding mechanism. The wheels can be adjusted to different width rows.

As a rule, four or five nozzles are provided on the one-mule cart duster, but the larger two-mule traction-powered duster often has five or six nozzles. Any machine that depends on traction with the ground to drive the feeding mechanism and high-speed fan naturally will give much wheel slippage. This is especially true if the soil is somewhat wet and slick, as it is difficult to get enough traction to drive the fan at high enough rate of speed to do a good job of dusting.

To obtain a first-class job of dusting under almost all field conditions it is necessary to have a duster equipped with a gasoline engine. (This does not mean that a good job cannot be done under suitable conditions with the traction types.) The engine-powered cotton duster produces a sufficient velocity of air to break up, separate, and atomize the dust particles to give a uniform coverage of the cotton plants, and increase the acreage that can be covered in a day or night of operation.

Another type of duster attracting considerable attention, especially from farmers owning tractors, is the tractor-mounted duster. These types are operated either from the belt pulley or the power take-off. With a tractor-mounted duster power is available to give sufficient air velocity to dust six to eight rows.

A good cotton duster should have a hopper so shaped that dust will naturally gravitate into the feeding mechanism or be provided with some type of agitator to keep the dust broken up and available to the feeding mechanism at all times. The feeding mechanism should be constructed so that there is always a uniform flow of dust and should have convenient methods of adjusting the rate and some type of indicator to give the operator an idea as to the quantity of dust being applied.

Before a cotton duster is purchased the machine should be carefully examined to determine whether repairs can be made with ease and at a minimum expense. Cotton dusters used under damp conditions often collect dust from the air, and this will cake on exposed parts and often gives trouble. All parts should be provided with adequate means of lubrication and thoroughly protected from dust, dirt, and grit. It should be ascertained before a cotton duster is purchased whether a supply of repairs is maintained at convenient points to avoid delays when repair parts are needed.

In selecting a cotton duster for an acreage of cotton it is well to figure on a size that will handle the acreage to be dusted within a period of two or three days. This is necessary to allow for delay from adverse weather condi-

tions or break down of the machine. Then too, if the same teams and men are used to cultivate the crop, enough time should be allowed between applications so that the same acreage can be given a cultivation.

According to Farmers' Bulletin 1729, a hand gun will take care of about 8 acres of cotton. The saddle gun will take care of 40 to 50 acres; the one-mule two-nozzle wheelbarrow type machine, 40 to 60 acres; the three- and four-nozzle traction-powered cart type, 60 to 80 acres; the engine-powered horse-drawn six-nozzle machine, 100 to 175 acres; and the tractor-mounted duster, 200 to 300 acres. (These estimates are high under the average weather and other actual working conditions on the farm. Remember that good dusting conditions are usually at night and early in the morning, and the good working hours per day are not as long as for other field operations, unless artificial light is provided.—Editor.)

Applying Sulphur and Sulphur-Calcium Arsenate Mixtures

Dusting sulphur is heavier than calcium arsenate and possesses certain fire hazards. If the feeding mechanism or other moving parts have friction enough to generate heat, there is danger of melting the sulphur and fire when dusting. When sulphur-calcium arsenate mixtures are applied, the machine should handle the mixture in such a way that the sulphur will not be separated from the calcium arsenate. When separation occurs it is either the fault of the feeding mechanisms or the construction of the outlets for the various flexible metal hose lines.

Dusting Versus Spraying

Entomologists feel that a more economical control of the various cotton insects can be obtained when dust is used than when a watery spray is applied. They claim that better coverage is obtained with dust for cotton insects and dust is easier to handle and does not require any water nor expensive pumps to put out water sprays under high pressure. Sulphur and calcium arsenate used alone or in mixtures will control the flea-hopper, boll weevil, boll worm, and leaf worm, all of which are serious cotton pests at various times of the year.

The Navajo Sheep Industry

Condensed from Sheep Breeder

J. M. Cooper

Director, Southwestern Range and Sheep Breeding Laboratory, Fort Wingate, New Mexico

WITH the exception of residents of the Southwest, few people appreciate the importance of the sheep industry of the Navajo Indians. The problems in connection with this industry concern not only those immediately responsible for Navajo administration, but also those white men who are engaged in commercial sheep production in the West as well. Some knowledge of the history, scope, and present status of the Navajo sheep industry may be of interest to sheep raisers, in general, of the United States.

Approximately 50,000 Navajo Indians occupy a land area of 16,000,000 acres in northern Arizona, northern New Mexico and southern Utah. Various parts of this region differ somewhat in topography, elevation, rainfall, etc., but in general the whole reservation is semi-arid and mainly suited to livestock raising. For several hundred years the inhabitants have been largely dependent upon their flocks of sheep and goats. Careful studies of the region and of the needs of the people clearly indicate that the Navajos must continue to look to range sheep for a large portion of their livelihood.

The origin and history of the sheep possessed by the Navajo people are somewhat clouded, but apparently their original stock was brought in by the early Spanish explorers. Indications are that this sheep was of the coarse lowland, or Churro, rather than the fine Merino type. Gregg makes reference to the sheep of 100 years ago in New Mexico, as follows:

"But the . . . small beasts of pasture (that is, sheep and goats in general), have of late been very much reduced in quantity; having suffered to a deplorable extent from the frequent inroads from the aboriginal 'lords of the soil'. . . . Indeed the Indians have been heard to observe that they would long before this have destroyed every sheep in the country, but that they prefer leaving a few behind for breeding purposes, in order that their Mexican shepherds may raise them new supplies."

Reprinted by permission from the Sheep Breeder, Chicago, Ill., May, 1939

This quotation adequately explains the manner in which the Navajo originally acquired his sheep. In his defense, it should be made clear that such activities were held in tribal esteem at that early date. His moral obligations and responsibilities have changed greatly with the passing years, and of late his flocks have been maintained through barter, purchase, and natural increase.

Gregg also states that:

"The sheep of New Mexico are exceedingly small, with very coarse wool, and scarcely fit for anything else than mutton, for which, indeed, they are justly celebrated. . . . The sheep there are also remarkable for horny appendages, which frequently branch out in double or triplet pairs, giving the head a very whimsical and grotesque appearance. I have seen some of them with at least six different horns, each pointing in a different direction."

A few sheep of this description may still be found in some of the more remote sections of the Navajo reservation.

The importance of the Navajo sheep industry has long been recognized by the Government, neighboring sheepmen, dealers in the products of the industry, and those individuals and organizations interested in Indian welfare. The last half century has witnessed many efforts to "breed up" the Navajo sheep by the use of rams of many of the improved breed types. Progress in these efforts to improve the quantity and quality of production has been retarded by the lack of consistent plans and adequate knowledge of principles of animal breeding.

Despite certain obvious and admitted weaknesses of the original sheep, they were hardy and well adapted to the region; the wool was long, lustrous, light-shrinking, excellent for the handweaving of rugs and blankets. As a result of the improvement efforts previously mentioned, the type of the 465,000 mature sheep on the reservation today is predominately grade Rambouillet, but there are evidences of the admixture of many other breeds. Present-day Navajo wool lacks uniformity, is poorly grown and prepared for the commercial market, and has lost many of the characteristics desirable for the handweaving of rugs and blankets. Poor management on an overstock range, combined with scrub breeding, has resulted in the production of sheep lacking uniformity in type, size, and quality.

With specific reference to the decreasing supply of wool suitable for hand weaving, Amsden states:

"The Navajo rug is becoming more a mass of knots, unevenly scoured and (being still greasy)

unevenly dyed, with every passing year. So traders today are carefully saving out all the old, straight, hair-like wool of the unimproved strains that is sold to them, and selling it back to the weavers; but of course it is not adequate to the demand, and it grows steadily more scarce."

In 1934, the Government made an exhaustive survey of the relation of sheep to the special and economic life of the Navajo. The findings of this survey pointed toward the urgent need for the establishment of an agency to work on the problems facing Navajo sheep raisers. Shortly thereafter, Congress authorized the establishment of the Southwestern Range and Sheep Breeding laboratory. In a broad sense, the objectives of this laboratory are as follows:

1. To determine the type of sheep best suited to the ranges of the region and to the needs of the people.

2. To develop this sheep after the foregoing determinations have been made.

3. To conduct work on flock management and range improvement leading toward a determination of the best methods of handling sheep and range to secure maximum production.

4. To assist, wherever possible, in the education of the Navajo in the various phases of sheep and range management, in order that they may derive the maximum economic benefits from the resources at hand.

Work at this laboratory is being conducted jointly by the bureau of Indian Affairs of the Department of Interior, and the Bureau of Animal Industry and the soil Conservation Service of the Department of Agriculture. In the work on this difficult problem, it is recognized that a sheep for the Navajo must grow wool that will be satisfactory for the handweaving of rugs, and that will be acceptable to the commercial markets. In addition, this animal must be able to thrive on the semi-arid ranges of the region, yield the maximum amount of meat when slaughtered for home consumption, and raise a lamb that will be satisfactory to the commercial feeder.

Because of its hardiness and adaptability for the region, a flock of approximately 800 head of old-type Navajo sheep has been secured and is being maintained at the laboratory. These sheep are being used in breeding studies, under the direction of specialists of the Bureau of Animal Industry. A portion of this flock is being kept in a pure state to attempt the improvement of wool and mutton by the application of scientific breeding principles. The rest of the flock is being cross-bred with improved rams in an attempt to introduce

certain desirable characters of the established breeds without losing the hardihood and other worth-while features of the old type. While the work is very new, some encouraging progress has already been made.

Certain steps that will prove very beneficial to the Navajo sheep industry are being taken by the administrative heads of the reservation. Since Rambouillet breeding predominates on most of the reservation, the general use of rams of this breed, that meet certain fleece and body requirements, will be continued. This policy will be followed until it is conclusively demonstrated by the laboratory or some other reliable agency that another sheep type is more suited to the country and the needs of the people. Good Rambouillet rams will increase the uniformity and improve the quality of wool and lambs from the commercial standpoint. In addition, a more uniform animal on which future improvements may be based will result.

In one small section of the reservation, however, a few of the old-type Navajo sheep may still be found and their retention is being encouraged. This is being done in an effort to maintain a supply of wool suitable for the weaving of rugs and blankets. For this purpose fine wool from Rambouillet type sheep has proved unsuitable. The distribution of wool from this section to weavers all over the reservation should result in an improvement in rug quality and an increase in income. Meanwhile, the research program is being directed toward the establishment of a sheep type producing wool acceptable alike to the weaver and commercial buyer.

Ram pastures have been established, and they are of great immediate benefit in insuring vigorous rams at breeding time, lambing at the proper season, and a reasonable uniformity in the age of lambs. Through education in the schools, extension on the reservation, and other means, the Navajo sheep raiser is being acquainted with improved methods of handling his sheep and range.

The necessity for securing a sheep type that will make the most economical use of the Navajo ranges for the production of the right kind of wool and mutton has been recognized. The machinery for the solution of this problem has been set in motion.

Potatoes for Livestock

Condensed from California Cultivator

Henry J. Beckman

WHILE some consideration has been given to the utilization of cull potatoes for by-products, such as starch, water paste, art gum, pancake flour, plastic wood and alcohol, few states have made much progress along this line. If some successful way of storing and holding these culls could be worked out, a vast amount of good feed could be obtained.

Potatoes contain 21.2 per cent of dry matter. Their total digestible nutrients are less than that of corn silage. Low in protein but rich in starch, they have a nutritive ratio of 1:14.7. It is apparent at once that most animals, particularly growing animals, would require alfalfa or other protein-rich feed in the ration to maintain a proper balance when fed heavily on potatoes. Generally speaking, the total digestible nutrients of potatoes is so low that they are worth less than one-fourth the value of grain for feeding lambs. Other factors need to be taken into consideration in this connection, however. Since they are succulent in character they may have a slightly higher value when fed to dry lot lambs eating only grain and hay, than they would have if the lambs had silage. In the fall of 1938 we fed Irish potatoes to a bunch of 300 lambs, in addition to alfalfa and whole barley. The amount of potatoes was gradually increased until they were getting nearly a pound per head per day. There was swelling and soreness at the sheath on the wether lambs. This difficulty is known as urinary calculi and upon reducing the amount of potatoes fed the trouble disappeared. When large amounts of potatoes were fed it was found that the lambs ate less grain but the gains were somewhat slower than when straight grain was fed. In experimental feeding of lambs reported by Morrison it was shown that the addition of potatoes to the ration slightly increased the daily gains and that one ton of potatoes was equal in feeding value to 185 pounds of grain plus 12 pounds of cotton seed meal and 430 pounds of alfalfa. If hay were worth one half the value of grain, which is probably a fair estimate in many parts of California, potatoes would be worth 21 per cent of the value of grain according to

these experiments, when used for lamb fattening. One big advantage in feeding them to lambs is that they can be fed raw which is not the case in hog feeding.

Hogs make good use of cooked potatoes as a part of their ration. Here again the low protein content must be kept in mind and some protein-rich supplement must be used to properly balance the ration, especially if the animals are in the dry lot. Salting the water in which potatoes are cooked, adds to the palatability. According to Morrison, 351 pounds of potatoes, weighed before cooking, fed in proportions not exceeding 4 pounds of potatoes to each pound of grain, and properly balanced for proteins and vitamins A and D, equalled 100 pounds of grain and other concentrates in feed value. From all practical viewpoints this is probably the top value that should be put upon them. Figuring 400 to 450 pounds equal to 100 pounds of grain would probably be a safer ratio.

Fed with alfalfa hay to beef cattle in place of corn silage, potatoes have proved worth about 80 per cent of the value of silage. In North Dakota potatoes have been tried on dairy cows in amounts up to thirty and forty pounds, per head per day. The cows lost their appetite for them when fed so heavily. The belief, however, that potatoes will dry up milking cows has no basis in fact, provided the ration is properly balanced.

Considerable interest has been aroused in Kern County in the advisability of making silage out of potatoes. According to H. T. Strong, assistant farm advisor, trench silos will be tried out and ground grain or sorghum will be added to supply the lactic acid bacteria lacking in potatoes. About 2 per cent of ground grain by weight is necessary to inoculate the mass with lactic acid bacteria so it will undergo the proper fermentation. This experiment will be watched with interest by the other growing sections which are anxious to conserve for feed the unmerchantable potatoes which are wasted each year.

GREAT GRAY OWL

Are They Vermin? (V)

E. Lawrence Palmer

Prof. of Rural Education, Cornell University

GREAT GRAY OWL

Scotiaptex nebulosa nebulosa
(Forster)

Description — Length, to 33 inches; wing spread, to 5 feet; weight, to 2 pounds, 14 ounces. Largest owl. No ear tufts but a large round head with yellow or straw-colored eyes; breast, not barred; wings, broad, rounded, are flapped slowly in flight. Color, dark gray.

Where found—Uncommon in New York. Essentially a forest bird and seen most commonly in winter if at all.

Range—Breeds from tree line in north central Alaska to Ontario and south to central California and Ontario. In winter, may move as far south as New Jersey and Wyoming.

Relations and life history—Closely related to Siberian gray owl which is occasionally found in America. Family, Strigidae. Breeds in forests, nesting in tall trees. Nest of sticks, with leaf or feather lining. Eggs, 3 to 5; 2.3 by 1.8 inches, white and smooth. Incubation by female for unknown time. One brood yearly. Young, downy, white when hatched, with back, neck and wings darker. First plumage much like that of adult.

Behavior—Food, largely mice and other small animals; 7 to 9 examined contained mice; 4, other mammals. One contained a small bird. Size of this owl and the fact that it sits on a perch at an angle help identify it. Call described as like that of the screech owl with deep pitched "whoos."

Reaction to heat, light, and moisture—Essentially a nighttime bird and so is rarely seen. It moves south in severely cold weather or when food is scarce.

Relation to man's interests—So uncommon in New York that it can do little damage to game and its record in destroying rodents is amazingly high. In spite of this, it is not protected by law in New York State; unprotected in 17 States.

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For the Farmer's Library

These books are recommended as outstanding in their field:

Poultry Husbandry

By Morley A. Jull, Professor of Poultry Husbandry, University of Maryland. Published by McGraw, Hill & Co. $3.50.

(See Farmers Digest, July, 1939)

Pork Production

By William W. Smith, Professor of Animal Husbandry, Purdue University. Published by the Macmillan Co. $3.75.

(See Farmers Digest, September, 1939)

Feeds and Feeding

By F. B. Morrison, Professor of Animal Husbandry and Animal Nutrition, and head of the Animal Husbandry Department, Cornell University. Published by the Morrison Press. $5.00.

(See Farmers Digest, October, 1939)

Beef Cattle

By Roscoe R. Snapp, Associate Professor of Animal Husbandry, University of Illinois. Third edition is to be published this fall. Published by John Wiley & Son, Inc. $4.00.

(See Farmers Digest, November, 1939)

For the convenience of our readers, books listed may be purchased through the Farmers Digest, Dept. D, Ambler, Pa.

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